THE UNIVERSITY OF HULL

Time, Pattern, Perception
Integrating Systems and Futures Thinking

being a Dissertation submitted in partial fulfilment of
the requirements for the Degree of

Doctor of Philosophy in Systems Science
in the University of Hull

by

Anthony Malcolm Hodgson, B.Sc., A.R.C.S., P.G.C.E.

TIME, PATTERN AND PERCEPTION

Integrating Systems and Futures Thinking

Anthony M. Hodgson

Contents

Figures

Tables

Introduction and Overview

The literature abounds with accounts of the increasing complexity and uncertainty of the contemporary world. This now appears to be a truism. Various disciplines and methods have sprung up over the last fifty years that attempt to address some aspects of this situation. These include, for example, a variety of systems thinking methods (Midgley, 2002; Jackson, 2006), a variety of decision support tools (Rosenhead and Mingers, 2001; Goodwin and Wright, 2010) and the field that is signified by terms like future studies and foresight (Miller, 2007; van der Heijden, 2009). All of these new methods, in one way or another, seek to bend or stretch or even reframe the notion that the world is deterministic and is still in-principle completely knowable. However, the uptake of foresight, even as complex crises accelerate in their frequency, is still scattered and piecemeal. There are good reasons for this.

The deterministic worldview has been immensely successful since the Enlightenment and the subsequent growth of science. However, in my view, we are reaching a point where simply bending and stretching this dominant worldview is not proving adequate. A paradigm shift in the way we tackle the contemporary world's issues is needed if we are to create a viable future in the Anthropocene Age, by which I refer to the current period in which human activity has become on such a scale as to have major planetary implications. To begin with, it is useful to make a distinction between those aspects of the world which are complicated and those aspects which are complex (Snowden and Boone, 2007; Poli, 2013). Scientific methods based on the reductionist assumption that explanation derives from smaller and smaller elements, we will refer to as first-order science. This has been immensely successful in investigating, unravelling, and intervening in the world of complications, having the power to discover a degree of simplicity that enables human control. This control is massively evidenced in the immensely pervasive technology that supports the modern developed world. In the world of complications, analysis into detail and reassembly of parts into wholes, works.

However, the very success and growth of the scientific worldview in its commonly accepted orthodoxy has expanded to the point where it is losing control. The human pursuit of science and technology and its application to human affairs, has now landed squarely in the world of complexity. Some scientists have investigated this world of complexity and discovered attributes and properties that do not fit with the deterministic, even probabilistic, worldview (Arthur, 1990; Kaufman 1996). In the world of complications it is still possible to make reasonably reliable decisions on the basis of systemic structures, trends, forecasts, predictions and mathematical formulae, as if the world was pretty much reducible to classical physics. Of course, the advent of quantum physics and relativity frustrated that position but the non-classical oddities of quantum theory and cosmology have not yet really entered the mainstream of the way people think and act.

But as the world of human affairs crashes into the world of nature and indeed into the world of itself, complexity becomes the dominant condition which renders limited, obsolescent, or even dangerous the thinking and decision methods of the reductionist era that has not appreciated the nature of complexity (Fuerth 2012, Poli, 2014). Completely new conditions need completely new thinking and completely new methodology if we are to be able to navigate successfully the world of complexity. I use the word 'navigate' very deliberately in the sense that, unlike the deterministic world, there are no simple A to B pathways in the world of complexity. Not only are actors subject to the uncertainties of small variations in initial conditions and the consequent emergent properties of unexpected interactions, they are also subject to the reflexivity of the consequences of their own interpretive actions which are also often unpredictable (von Foerster, 1979; Luhmann, 2000).

Based on my personal engagement for over fifty years with these kinds of issues at a very practical level in working with managers and decision makers mainly in the corporate world, I have come to see both the inherent value of alternative methods of thinking and doing and also see how immensely against the grain of the momentum of the conduct of human affairs these kinds of methods are. Reflecting on this tension between the potential and the actual, linking in my mind theoretical considerations concerning complexity with feedback from the hard grind of consulting in a complex and uncertain world has led to the thoughts reported in this thesis.

At the start of this research I posed the following questions:

1. What positive contribution might systems thinking make to better frame the nature and methodology of scenario and futures based strategy work in business, governance and community resilience?
2. What positive contribution might scenario thinking make to the nature and methodology of systemic intervention in business, governance and community resilience?
3. What aspects and developments of epistemology and ontology can help shed light on the nature of both futures thinking and systems thinking, in terms both of positive potentials and also critical limitations?
4. What might a new metatheory of strategy formation look like which integrates the learning from the above three questions?

Although these questions came to mind during the research reported here, the questions mutated as I became more aware of some of the assumptions behind the questions.

My primary focus is *systems thinking* and its background of systems science, which has accumulated a few principles that indicate its distinction from more analytical methods of thinking. These principles include wholeness, openness, diversity and emergent properties (Flood and Carson, 1994; Gharajedaghi, 2006). In various forms they are considered to be better suited to dealing with the world of complexity. What struck me most forcibly in reflecting on these decades of experience was the fragmentation in those very fields which claim to be supporting integrative and holistic thinking

and methods (Midgley, 2002; Jackson, 2003). It would contradict its own law of requisite variety[1] (Ashby, 1956, Beer, 1985) if the systems thinking field was reduced to a homogeneous body but, equally, disconnected diversity does not lead to effectiveness in a complex world (Beer, 1974; Flood and Jackson, 1991; Midgley, 2000).

My secondary focus is futures thinking (Miller, 2011). It became clear to me from my field experience that connecting futures and systems in an effective way for practical affairs was difficult. Processes of synthesis are more than ever required. What also struck me was that the benefits that I saw arising from strategic futures techniques like scenario planning (van der Heijden, 2005) were at best only weakly coupled with the benefits that could arise from systems thinking in the field of strategy. And it seemed to me that even these were rarely adopted.

In this work I propose some ideas and an approach that addresses these issues by seeking to integrate key principles from systems thinking with key principles from futures thinking within a new philosophical foundation that could frame improving the practice of strategic decision-making (Barber, 2006). This has required the development of what is referred to as a "meta-framing" (Rossel, 2010) of the two fields generated by some transdisciplinary thinking about the nature of time, pattern and causality. Systems are patterns of relationship, structures that exhibit behaviour over time and modify the way in which we interpret causality, for example in causal loops where effects can become causes. I believe there is a strong feedback interaction between worldview and action, just as neuroscience has shown there is a strong feedback interaction between thinking and feeling. In other words, if we can change our internal perspective on what is going on and what role we might play, we can increase our room to manoeuvre in the way we go about our practical affairs. Hence the third word in the title of this thesis is perception.

This leads to the consideration of approach and method. This research posed me a strategic dilemma as to how to go about it. Since the very challenge I am addressing is around the fragmentation that specialised reductionist worldviews constrain the configuration of knowledge and but since the purpose of this research is to investigate synthesis and integration, the methods generally adopted in first-order science do not fit. This posed what seemed an unavoidable paradox that I would not know which methodology to pursue until I had completed enough of the investigation to discover the method to be employed.

However, the pursuit of an emergent strategy seemed consistent with the purpose and this eventually stepped beyond the paradox and, at least partially, resolved the dilemma. The resolution has taken the form of clarifying that the work reported here is itself an example of an approach and method consistent with the emerging field of second-order science or science 2.0 (Muller, 2016; Muller and Riegler, 2014). The interesting methodological discovery is that the very nature of the

[1] The principle of requisite variety means that effective guidance system of a larger system requires an adequately matching number of states to the number of states in the larger system being guided,

challenge has driven a process that, on reflection, is consistent with the only recently published proposition as to what a generic method of second-order scientific enquiry might be (Muller, 2014).

Before outlining this method it is necessary to describe some key notions of second-order science which distinguish it from first-order science. Several of these features are anathema to the mindset of first-order science as they appear either as illogical constrictions or fallacious positions. However, the two views (from the perspective of second-order science) are not contradictory because of the principle of correspondence (Bohr, 1976) in which first-order science appears as a special case of second-order science. Put another way, each field of knowledge at the first order level has a corresponding counterpart at the second-order level.

Some of the main features in second-order science are (Umpleby, 2014):

- Reflecting on the explorations of first-order science
- Incorporating rather than excluding the observer from the observation
- The application of 're-entry', where elements of first-order science are applied to themselves; e.g. the cybernetics of cybernetics
- Systems under investigation are themselves dynamically changed by the investigation
- The reframing of framing – often referred to as meta-framing where attention is paid to the underlying frames of reference that are often taken for granted
- A thoroughly transdisciplinary approach

Muller and Riegler (2014) identify three major functions of second-order science: firstly, to trigger innovations and inventions; secondly, to give another perspective to evaluation and interpretation of first order science and thirdly, to promote integration of first order results in higher order inclusive perspectives. This work concentrates primarily on the first function but with some attention to the second and third.

Another related approach which engages with this investigation of second-order perspectives is that of DeZeeuw (1997). He considers there to be three phases of science. In the first phase, corresponding to first order science, the observer is detached from the observations; in second phase science the contiguity of the observer and the object is recognised and hence also recognise its descriptions are constructed; in third phase science multiple distinct observers are involved and equally concerned with social change as with knowledge. In my view both second phase and third phase science are modes of what I am calling second order science. Second order science does not need to be restricted to single lens observation (Bausch and Flanagan, 2013) and in the science of qualities intersubjectivity is an important component (Goodwin, 2007).

A fuller description of second-order science is given in Chapter 10. The methodology is summarised below an further described in Chapter 17 in conclusion.

Although the methodology was emergent, the essential features of it are described here drawing on Muller (2014, p218-228). A fuller account is given in the final Conclusion of Chapter 17.

Step1 – Choose First Order Theme of Inquiry

Could a meta-theory that integrates systems thinking and futures thinking be constructed?

Step 2 – Creation of Second-Order Topic through Reflexivity

What insights emerge from reviewing reflexivity in systems thinking and in futures thinking?

Step 3 Formulating the Goals of the Thinking Task

Creating a concept that integrates systems thinking and futures thinking

Step 4 Widening the Thinking with Further First Order Topics

Seeking additional perspectives from phenomenology of time experience, anticipatory systems, boundary critique, an ontology of the present moment, and the nature of induction and reperception

Step 5 Re-configuring First Order Topics for Breakthrough

This step occurred as the creation of the Anticipatory Present Moment (APM) model.

Step 6 Integrating, Deepening, Heightening, Synthesis

This step was the development of the APM as a metaframing tool to gain new insights into systems and futures

Step 7 Reflecting in Implications for First-Order Themes

This was the application of the APM to six conceptual methods as a second-order reflection. The point of this theory is to provide a meta-framing that integrates the core thinking behind systems and futures from a second-order perspective.

Step 8 Considering Impact on the Wider Context

This was done through a couple of small practical experiments in using a 'present moment mindful method' based on the APM.

My approach has been transdisciplinary as a reflexive practitioner trying to make fresh sense of fragmented material that offers the prospect of promoting greater effectiveness if seen from an integrating perspective. From these aspects I have concentrated especially on the generation of novel interpretations of well-established first-order methods and ideas in order to see if theoretical insights are generated of sufficient power to also promise contribution to practice and application, especially focussed on strategic decision making.

I will now describe the basic structure of this thinking as set out in the sequence of chapters that follow. Consideration of the sources, influences and critical thinking for this conceptual journey is elaborated in detail in the chapters themselves. The book is divided into four parts.

Part1 has the overall theme of *Navigating Complexity*.

There are many ways of framing situations in order to take decisions or solve problems. The bulk of these are based on analytical methods and tools from fields such as economics, numerical analysis, logic trees, weightings of factors and so on (Kleindorfer et al, 1993). The more sophisticated

methods constitute the field of decision sciences. Similarly there is a corpus of problem solving methods, some of which are analytical and others which involve synthesis. These methods have become well developed and finely honed by specialists (Mcdermott, 1988). However, they tend to address the world of complications rather than the world of complexity. The world of complexity has been characterised as the domain of 'wicked problems' (Rittel & Webber, 1973), which present problematic situations which cannot be sliced and diced by analytical methods in ways that divide them into neat parcels to be solved separately, with the multiple solutions then stitched together to form a whole resolution (Kahane, 2004). This is where systems methodologies have more traction and where futures methods like scenario planning (van der Heijden, 2005) and causal layered analysis (Inayatullah, 2004) can contribute, as they assume that the parts of problematic issues interact with one another, so any proposed action for improvement has to account for these interactions. In *Chapter 1: The Challenge of Decision Thinking in a Complex World,* these considerations are described in some detail and the distinction between complicated and complex is spelled out (Poli, 2013).

In *Chapter 2: Two approaches – systems and futures*, systems approaches to elaborating structure, feedback and dynamism are summarised, pointing out their salient features for addressing complexity. The underlying essentials enable a brief review of the diversity of the field to be summarised as methodological pluralism. Drawing from the field of cybernetics, an important distinction is made between first order and second order treatment of systems (von Foerster, 1979). In the former, the system is considered 'outside' the observer and subject to detached scrutiny. In the latter, the observer is a participant in the system and interacts with it; the system is seen from a particular perspective, which informs action, and this in turn informs the system's reaction, which may or may not change the perspective of the observer, depending on whether he or she can perceive that reaction. This second mode can be viewed as a phenomenological approach to understanding time, pattern and system (Husserl, 1991), and the meaning and implications of this statement is spelled out in more detail. Also in this chapter, a broad sweep is made of the field of foresight and futures studies (Chermak et al, 2001, Slaughter, 2004; Börjesona, L., and Höjera, M., 2006, Bishop et al, 2007) indicating the different worldviews of time and change which are entertained by them. The chapter concludes with a comparative study of how far systems thinkers have embraced futures thinking and the converse.

The conclusion from this review is a proposition that, despite its sophistication, the ways of thinking about the world and the consequent options for action are inadequately matched to practical engagement in decision complexity. *Chapter 3: Complex World; Complex Thinking* addresses this issue by drawing on the thoughts of others (e.g., Montuori, 2013). This chapter particularly examines the need to step beyond specialisation and reductionism to a transdisciplinary approach (Wilby, 2011) that transcends the usual disciplinary categories. This requires complex thought (Morin, 2008) to match more closely the complexity we encounter in the world. It means that narrow scientific

orthodoxy does not have the required variety of perspectives to support the needed navigation of complexity. Both philosophical and neurobiological advances are drawn on to support this view (McGilchrist, 2009).

Part 2 is about *Thinking Reflexively*.

Chapter 4: Thinking Reflexively in Systems takes up the idea mentioned earlier that there is a distinction between the view of systems as objective "out there" entities seen by a detached observer, and the view in which the observer is participating in creating the systemic nature of the entity (von Foerster, 1995). This second view has been referred to as the cybernetics of cybernetics, or second order cybernetics. The nature of reflexive systems is described, bringing out important distinctions between the two viewpoints and pointing out their implications more thoroughly in relation to the distinction between the world of complications and the world of complexity (Umpleby, 2010). Also I introduce a way of relating the notions of second order cybernetics to the nature and ethical grounding of decision-making (Hodgson, 2010). The distinction between first and second order is a critical determinant of how we go about practical problem-solving and decision-making, even if the effect is largely subconscious and unexamined (Scott, 2007).

There is a parallel distinction to be made with regard to the treatment of time and its meaning. This is the subject matter of *Chapter 5: Thinking Reflexively in Time*. A view of time which corresponds to first order thinking is that of chronological sequence, of ‘one thing after another’ and of the single direction of time’s arrow (Gell, 1992), although this linear sense of time has been dismissed as illusory by others (McTaggart, 1908; Barbour, 1999). There is a second order view of time in which its sequential nature is retained, but not as an exclusive explanation. This view of time is enriched by other perspectives and dimensions of experience which colour the interpretation and meaning of the time experience (Husserl, 1991). This leads us into the domains of the phenomenology of time experience, of presence, of the present moment, and of the distinction between the actual ‘now’ and the potential ‘not yet’ and even to the possibility that in some sense the future already ‘is’ and influences the present (Poli, 2011, Hodgson, 2013).

Emerging from these two reviews, one of systems and one of time, is my view that there is scope for innovative synthesis if we bring them both together. *C*hapter 6: *The Need for Synthesis* reviews some of the weaknesses in most systems thinking where the futures dimension is neglected. Equally, it reviews some of the weaknesses in futures thinking and foresight, which arise because the nature of systems is only weakly considered. A theoretical project to integrate these two disciplines into a new formulation is stated, and a preliminary indication is given of the implications for decision-making practice (Hodgson, 2010).

The way we experience the passage of time and also how we are aware of pattern are considered next. In *Chapter 7: The Phenomenology of Time Experience*, I draw on some key concepts and conclusions from areas of quantum physics which include extended notions of dimensionality.

This has crucial implications for systems thinking since it stands dominant assumptions about causality on their head (Feynman, 1963; Albert, 2000; Di Corpo & Vanini, 2010). It also has crucial implications for the nature of anticipation in the development of strategy and policy (Callender, 2011).

This illustrates how first order thinking has discarded important aspects of physics which indicate time is more complex than the linear view and involves second order characteristics. This opens the possibilities of a richer interpretation of the nature of causality.

Part 3 introduces the idea of the *present moment*.

Having loosened up the ideas of time, we now explore more fully the implications of time and the present moment. *Chapter 8: Being in the Present* describes a hypothesis as to a different holistic approach to situations prior to any separation in our minds of system and time. This sets us a challenge of shifting our worldview in a way that is not only theoretical in the abstract sense but changes our existential mode of experiencing and therefore the options for action. A richer picture of approaching the future emerges.

The question now is, how do changes in our mode of experience occur? *Chapter 9: Re-perception and Cognition* reviews some of the ways in which changes of mind and worldview can take place. These range from the very pragmatic approaches of experienced leaders in the field of scenario thinking and foresight (Sharpe and van der Heijden, 2007) to the conceptual approaches of complexity scientists and psychologists towards understanding the nature of induction (Holland et al, 1986). The nature of reperception is examined in three different ways: firstly as inductive learning, second as creativity and third as enactive cognition.

In *Chapter 10: Life, Consciousness and Anticipation* the need for a new paradigm of science is discussed, leading to the idea of second-order science (Umpleby, 2014). A different but complementary approach to a new science paradigm, a science of qualities, is also described (Bortoft, 1996; Goodwin, 2007). This paves the way to introduce the concept of anticipatory systems (Rosen, 1985) extended to include the process of reperception (Burt, 2010) in the observer participant.

In *Chapter 11: Systems and Futures as One Whole* the basic conjecture that it is possible to construct an holistic viewpoint of the nature of situations that includes both systems and futures as an integral pattern is described (Bohm and Nichol, 2003). The foundation for this work draws on six main threads: Husserl's model of time consciousness (Gell, 1992) , the nature of anticipatory systems (Rosen, 1985), the ontology of the present moment (Hodgson, 2013), boundary critique (Midgley, 2000) and the scenaric stance (Ogilvy, 2011). Different perspectives on past, present and future are described. This assembles a platform on which the notion of purpose or teleology can be brought into the synthesis.

The core proposed concept of this work is now constructed in *Chapter 12: The Anticipatory Present Moment.* The synthesis begins from the phenomenology of time consciousness extended by

the ontology of the present moment and then integrates the different components that have been described in previous chapters. This requires the consideration of some quite radical ideas including the multi-dimensionality of time, the substantive reality of potential and the relationship between consciousness and choice. The essential approach is borrowed from phenomenology but also draws on aspects of theoretical physics and cosmology that have largely been side-lined by mainstream science. The overall proposition for synthesis I have named *the anticipatory present moment*. From this concept, two conceptual tools for meta-framing are constructed.

The theme of Part 4 is *Implications for Practice.*

These chapters move from concepts towards considering the practical implications of the anticipatory present moment applied to the praxis of decision-making. This requires a review of the main characteristics of present day decision-making as practiced in business management, governance and daily life (e.g. Mitroff et al, 1979); reviewing the dysfunctional and even pathological consequences of these characteristics (Hodgson, 2010); and pointing out how the theory expounded here offers new possibilities for practical investigation. *Chapter 13*: *Decision Thinking Re-examined* brings us back to reconsidering the nature of complex thinking described in Chapter 3 in the light of this new meta-framing. The anticipatory present moment becomes a way of practicing decision integrity, interpreting decision-making from the perspective of reflexivity and the meta-framing.

The anticipatory present moment also offers a fresh way of interpreting the nature of some key concepts and methods of decision support from both futures and the systems field. In *Chapter 14: The APM as Meta-framing*, four examples are described. These are dilemma modelling (Hampden-Turner, 1990), viable systems (Beer, 1985), boundary critique (Midgley et al, 1998) and a transdisciplinary world model (Hodgson, 2012). The analysis highlights different aspects where APM can enhance understanding of their relationship to consciousness and decision making.

Another application of the APM tools is to bring out some deeper meanings in foresight using the three horizons method (Sharpe, 2013). The three horizons method proposes that there are three kinds of future related to three states of mind that are generally present but largely taken for granted or disallowed and therefore not available for reflective development. In *Chapter 15: Appreciating the Future*, I explain the concept of three horizons (Curry and Hodgson, 2008; Sharpe, 2013) as well as the way these reflect themselves in our anticipatory present moment. Research in neuroscience (Ingvar, 1985; McGilchrist, 2009) provides some support for this view; there may well be and neurobiological basis for this way of appreciating time and the future.

Having considered the implications for decision-making, the relationship between the present moment and the three kinds of future, *Chapter 16: The Mindful Practitioner* emphasizes that the previous conceptual analysis and synthesis will fail to be consistent with second-order science if it does not include, in a reflexive way, the personal consciousness of the practitioner or scientist. Any observation is made by an observer. This takes us into the field of mindfulness and practices in which

consciousness needs to be exercised in particular ways to improve systemic insight and foresight. Illustrative experiments are described suggesting possibilities for new practices in strategic, systemic and futures thinking that might yield interesting insights and possibilities. This goes beyond scenario method and suggests both developmental and technical enhancement of reflexive decision making supported by systems thinking and foresight.

In the spirit of second-order science, each chapter concludes with a personal reflection on the thought process and consideration which has led to the structure and content of that particular chapter. Hopefully this will render more transparent both the reasoning and creative synthesis involved.

Chapter 17: *Conclusion* recapitulates the research questions and the process of arguing and unfolding the thesis that ensued.

PART ONE – Navigating Complexity

Chapter 1: The Challenge of Decision Making in a Complex World

> *"Here, we can see that systemism and cybernetics are the first stage of a rocket that allows for the launching of a second stage, the theory of self-organization, which in turn fires of a third, epistemological, stage, that of relation between subject and object."*
>
> (Morin, 2008, p23).

In this chapter I wish to draw some clear distinctions between viewing the world as complicated and viewing the world as complex. Rather than approach this historically, I will approach it more in the manner of layers of thinking. Although complexity thinking has gone beyond the established sophisticated methods of analysis for complicated situations, it is not that the complex has displaced the complicated but rather that it overlays it. The main reason for beginning with this review is to establish a basis for the case I am making that the ways of thinking that serve us well in a complicated world are inadequate, even misleading, in the complex world. This viewpoint has been expressed by a number of thinkers in the systems field, but the notion is well summarised by the following quotation from Stafford Beer.

> *"Man is a prisoner of his own way of thinking*
> *and of his own stereotypes of himself.*
> *His machine for thinking*
> *the brain*
> *has been programmed to deal with a vanished world.*
> *This old world was characterised by the need*
> *to manage things –*
> *stone, wood, iron.*
> *The new world is characterised by the need*
> *to manage*
> *complexity.*
> *Complexity is the very stuff of today's world."*
>
> (Beer, 1975, p1).

1.1 The Complicated World

Since the European Enlightenments the modernist project has proceeded on the basis that our understanding progresses through increasingly understanding the world and thereby having the knowledge and power to control it. The dominant thinking of both science and practical affairs are locked into a paradigm behind these assumptions. Albrow (1997) summarises the position thus: *"Modernity holds its adherents in a double bind: it promises new futures and at the same time denies any possibility of an alternative to itself."* (Albrow, 1997, p1).

The world has become more complicated since the Industrial Revolution by 300 years of development that have brought about an accelerating globalisation of the political, the trading and the technological aspects of life. In recent decades this acceleration has greatly speeded up through the pervasive nature of information and communication technologies and their widespread adoption by most societies around the world. As a result, the world has become much more complicated and much more impactful on the planet, to the extent that the current age is often now named the Anthropocene; i.e., the age where human beings became the dominant influence on the trajectory of the global system (Crutzen and Schwagerl, 2011). The resultant conditions are now beyond the scope of sophisticated analysis of the complicated, as evidenced by the frequency of unintended consequences of human actions. Factors such as the impact of climate change, large scale urbanisation and the power to modify the biosphere and the lithosphere embed us in complexity beyond complication.

The complicated world has been dealt with very successfully over the last three hundred years or so by the power of analysis, specialisation and derived policy which divides up the complicated into component parts and solves its elements separately. The multiple solutions add up to a successful outcome. This success has been driven by the power of specialisation and the dominant worldview that the complicated can be managed by the summation of those component solutions in which nothing is lost on the way. This process has released tremendous power to affect the environment, and has further multiplied our impact through the exponential growth of the human population.

To handle the complicated world, disciplines such as systems engineering, logistics, project management, functional hierarchies and decision sciences have been developed and are seen to be effective in looking at, for example, massive projects such as space travel, fossil fuel extraction technology, city infrastructure, advanced manufacturing robotics, and genetic medicine. A few decades ago, it appeared uncontroversial to many that, through the rational enlightenment, humanity had tamed an irrational world of nature, and the logic was to follow a globalisation pathway to tame the rest of the world. Accordingly the approaches to policy and decision-making followed the three Ps of prediction, planning and performance.

In this complicated world, processes are largely considered to be linear, causality is time bound, and the future is determined and therefore, in theory, predictable; calculus and causality rule. This strengthened the underlying paradigm of determinism which seemed to dominate human commitments through abstract economics and metrics such as return on investment (ROI), net present value (NPV) and the logic of the decision sciences. Turbulence, triggered by such events as war, disease and natural catastrophe were viewed as aberrations that would eventually be conquered. Continuous economic growth was, and generally still is, seen as *the* way to ensure prosperity. In the face of turbulent aberrations, ‘resilience’ was the way to ensure bouncing back to normal.

This is the basis of the *complicated world* also referred to as the Machine Age (Ackoff, 1974). The essential features of the complicated world have been characterised (Poli, 2013a`) as

composed of systems which can be structurally decomposed, are pretty much closed in relation to their environment (or at least can be *viewed* as closed without any significant unwanted effects), and which can be represented by models. And any limitations in the modelling can be rectified by further analysis and information gathering.

1.2 The Systems World

However, in this complicated world, both simple and deterministic bases of managing society became increasingly frayed at the edges with contradictions. Past success becomes the formula for present and future failure (Pascale, 1999). Massive contradictions begin to emerge in human affairs and their scale and impact continues to escalate. For example, two world wars followed by a 'cold' war led to the machine logical view of mutually assured destruction (MAD) as a policy for peace. These contradictions coupled with the limitations of analytical specialisation have already provoked the emergence, albeit weakly taken up and practiced, of different approaches that attempt to embrace the complicated world as one including structures in which interaction and relationship are as significant as the component elements. One field which drove this type of development was telecommunications. For example, in the Bell Telephone laboratories, the discipline of systems engineering was developed. Hall (1962) was one of the leaders in this field. He acknowledges the limitations of specialisation and the use of the term complexity is introduced, although not yet with the full connotations of complexity science.

> *"It is hard to say whether increasing complexity is the cause or the effect of man's effort to cope with his expanding environment. In either case a central feature of the trend has been the development of large and very complex systems which tie together modern society. These systems include abstract or non-physical systems, such as government and the economic system. They also include large physical systems like pipe line and power distribution systems, transportation and electrical communication systems. The growth of these systems has increased the need not only for over-all planning, but also for long-range development of the systems. This need has induced increased interest in the methods by which efficient planning and design can be accomplished in complex situations where no one scientific discipline can account for all the factors. Two similar disciplines which emerged about the time of World War II to cope with these problems are called systems engineering and operations research."* (Hall, 1962, p5).

From the mid-20th century, other viewpoints have been imagined and explored through such gatherings as the Macy conferences (1946) from which emerged cybernetics and approaches of systems thinking. Another example around this time was the formation of the Society for General Systems Research (now named the International Society for the Systems Sciences, ISSS, 2014), which was an interdisciplinary counter movement away from specialisation and reductionism. Hammond (2003) sums up their aspirations of that time.

> *"For the founders of the society, systems theory was a theoretical framework that was holistic, taking into account the interrelationships and interdependence between the parts of the system, as well as the relationship between systems and their environments. They saw this approach as a significant departure from the more reductionist approach of traditional science, which sought to understand systems by breaking them down into their smallest parts, fragmenting knowledge about the world to increasing specialisation of separate disciplines that had very little interaction with each other. Although they acknowledged that specialised knowledge was important, they hope to develop a workable framework for integrating different fields of study."* (Hammond, 2003, p11).

This was not just a theoretical or intellectual enterprise, but also founded various approaches to establishing peace, dealing with the nuclear threat, and providing some of the foundations for the emergence of a more fully fledged discipline of ecology. These developments stimulated a counter stream questioning the universal validity of reductive fragmentation with a view that a different way of interpretation based on systems thinking had more promise of corresponding to what is actually going on. The linear explanation was seen to be inadequate and its practical outcomes often led to unintended consequences more problematic than the original concern. The systems age was emerging (Ackoff, 1974).

New concepts emerged such as cybernetics, feedback, deeper structure, requisite variety and recursion. The diagnostics of problem definition leading to problem solving no longer pertained. Instead of problem definition, terms were introduced such as 'messes' (Ackoff, 2001), 'problematique' (King and Schneider, 1991), 'wicked problems' (Rittel and Webber, 1973). To illustrate this difference, these are some of the characteristics of this kind of challenging situation for which the complicated notion of 'problem' is inadequate. Notice that the terminology of 'problem' is hard to transcend! A useful summary of 'wicked' reinforced from my consulting experience is:

- no unique "correct" view of the problem
- different views of the problem and contradictory solutions
- problems are connected to other problems
- relevant information is often uncertain or missing
- multiple value conflicts between multiple stakeholders
- multiple constraints
- considerable uncertainty, ambiguity

The practical experience of dealing with these factors stimulated further shifts in systems philosophy. For example, Checkland (1981), who came originally from a systems engineering background, took a different route in the face of limitations of the early conventions of systems thinking (specifically systems engineering). He observed that, despite sophisticated problem solving methods, 'single problem, single solution' approaches were inadequate; they didn't work. A new methodology was needed in which multiple perspectives could be integrated between diverse stakeholders with interests in the situation in question. Checkland and his colleagues (Checkland,

1981; Checkland and Scholes, 1990; Checkland and Poulter, 2006) developed soft systems methodology (SSM) to address this need. In SSM, the different worldviews of the stakeholders participating in the exercise are made explicit, and the messy rich picture of the situation is mapped prior to any consideration of a system model as such. The assumption of the methodology is that it is important to look for the best possible accommodation between conflicting viewpoints in order that practical improvement can be made.

Another example of a fresh approach was that of Ackoff (2001), who emphasised that any problem is always connected to other problems forming a set of interrelated problems. There being no word for 'systems of problems', he introduced the term *messes*. A mess is a system of external conditions that produces dissatisfaction. Rather than problem solving, he talked about 'mess management' and also took a design approach to resolving messes.

> *"Every organization is faced with a set of interacting threats and opportunities, a system of problems that we call a mess. The aim of this phase of planning is to determine how the organization would eventually destroy itself if it were to continue behaving as it is currently; that is, if it were to fail to adapt to a changing environment, even one that is perfectly predicted. Identification of this Achilles' heel - the seeds of its self-destruction - provides a focus for the planning that follows by identifying what must be avoided at all costs."* (Ackoff, 2001, p5)

Yet another example is the early work of the Club of Rome in which Ozbekhan (1970) identified a list of 49 critical continuous problems (CCPs) that exhibit similar characteristics to the definitions of both 'wicked problems' and 'messes', and have planet-wide implications which are still strongly in evidence after over 50 years, perhaps indicating that they are simply not 'soluble' in the conventional terms of problem/solution.

> *"It seems reasonable, therefore, to postulate that the fragmentation of reality into closed and well-bounded problems creates a new problem whose solution is clearly beyond the scope of the concepts we customarily employ. It is this generalized meta-problem (or meta-system of problems) which we have called and shall continue to call the "problematique" that inheres in our situation."* (Ozbekhan, 1970, p13)

In this more open and complicated world of 'wicked', 'messes' and 'problematique' the notion of system becomes far more complex and much more entangled with the social environment that it is embedded in. For example, stakeholder A's solution might turn out to be stakeholder B's disaster, especially if B has been excluded or marginalised. Such a situation is sure to invoke unintended consequences. Such difficulties in the systems field led Midgley (1996) to question the very roots of systems science. He regards the issues that emerge as paradigmatic, that is revealing deeper assumptions which are at the foundation of our notions of reality. This is not simply an abstract philosophical question since it determines both approach and action. The tackling of any problematique raises a fundamental contradiction between the dominant reductionist paradigm that current science is confined to and the need for congruent approaches that are truly interdisciplinary,

even transdisciplinary, and have the creative flexibility to draw on the whole variety of systems methods

> *"I then suggested that disciplinary restrictions on enquiry are associated with methodological restrictions. This presents a major problem for the systems science because, in trying to move beyond disciplinary specialisation, the inadequacies of traditional methodological positions are revealed. The result has been defensive battles between proponents of different methodologies. These threaten to undermine the integrity of systems science because it is clear that no isolationist systems paradigm is capable of addressing the variety that is thrown up when disciplinary boundaries are transcended."* (Midgley, 1996, p34-35).

The need for multiple stakeholder involvement also led to the emergence of group decision support methods. Although at first glance only partially based on systems thinking (Rosenhead and Mingers, 2001), increasingly, the idea of participative problem structuring became another response to the challenge of diversity, multiplicity and ambiguity as the context for arriving at specific commitments. Critical to this approach are two components. Firstly, there is some framework which acts as a meta-system to the content of the situation in question. For example, Friend and Hickling (1997) developed a method called *analysis of interacting decision areas* (AIDA) which provides a discipline for a group to go through four rational stages of decision-shaping, design, evaluation and commitment. Secondly there is the provision of skilled facilitation which deals with the personal and group dynamics of going through such a process. Franco (2006) has summarised the requirements for effective dialogue in such problem structuring exercises. He summarises the facilitator effect thus:

> *"It is generally recognized that there is a facilitator effect in most PSM-based interventions because such interventions are not disengaged processes (Phillips and Phillips, 1993; Ackermann, 1996; Taket, 2002). Thus, monitoring the levels of comprehensibility, sincerity, legitimacy, and accuracy during conversation will pose significant demands on the PSM facilitator. Furthermore, it is contended here that the skilled PSM facilitator must put an emphasis on ensuring that the resulting problem structure is the product of genuine dialogue among all participants, and resist the temptation to support debate, persuasion or negotiation types of conversation as means to validate or legitimize particular problem structures, in the hope that this would ensure rapid progress during a PSM workshop."* (Franco, 2006, p819).

The challenging issue emerging out of all of this period of the development of systems thinking was the recognition that complex adaptive systems have characteristics that put an inherent limitation on the application of these kinds of methodologies. The innovative engineering designer Buckminster Fuller (1975) put it this way: "*Synergy means behavior of integral, aggregate, whole systems unpredicted by behaviors of any of their components or subassemblies of their components taken separately from the whole."* (Fuller, 1975, Item 102.00 p3).

Defining systems was seen to be limited since a fundamental property of them could not be accounted for, namely that of emergent properties (Corning, 2010). This leads us to consider in a more direct way the world of complexity.

1.3 The Complex World

The maturing of the field initiated as general systems theory (Hammond, 2003), and now referred to as the system sciences, has also led to its crystallisation in a collection of sub-fields, each with differing concepts, methods and philosophical assumptions. As Midgley (1991) points out in his affirmation of methodological pluralism, this gives us a greater variety of 'tools for jobs'. In parallel with this maturing, the field of complexity science also emerged. Ideas of emergent properties, attractors, fitness landscapes and fractals have come to be used to explain the way that the complex world never-the-less throws up order. Kauffman, (1996) made many experiments with techniques like artificial life and came to the notion that complexity, as distinct from the complicated, can deliver 'order for free'.

Arthur (1990) introduced the idea that economies follow states that can flip from one to another and that the triggers for this may even be inherently unpredictable.

> *"In this view of economics, initially identical economies with significant increasing returns sectors do not necessarily select the same paths. Instead they eventually diverge. To the extent that the small events determining an overall path remain beneath the resolution of the economist's lens, accurate forecasting of the economy's future may be theoretically, not just practically, impossible.*
>
> *Steering an economy with positive feedbacks so that it chooses the best of its many possible equilibrium states requires good fortune and good timing—a feel for the moments at which beneficial change from one pattern to another is most possible. Theory can help us identify these states and times. And it can guide us in applying the right amount of effort (not too little but not too much) to dislodge locked-in structures."* (Arthur, 1990, p12).

To tackle the complex world I believe we need both systems science and complexity science. We also need to shift from a reductionist science to a science of synthesis in which the observer is not excluded. I will say more about this in Chapter 4 in relation to second order cybernetics. There is also something we can learn from the field of design. Design involves human desires and human creativity. It also has outcomes that are in the domain of human satisfaction. (Remember Ackoff's point about messes being identified through dissatisfaction.) A prime example of this is Alexander's (1977) pattern language, in which both function and aesthetic are codified in relational patterns that can guide the designer. My view is that pattern can be a word that stands for more than we can contain in the concept of system, of whichever school of thought. Bateson (1972) saw this in his declaration that the violation of inherent patterns is the way our mistakes come back to haunt us. Pattern stands for a quality of nature beyond the complicated, although it contains it.

> *"`If we continue to operate on the premises that were fashionable in the pre-cybernetic era, and which were especially underlined and strengthened during the Industrial Revolution, which seemed to validate the Darwinian unit of survival, we may have twenty or thirty years before the logical reductio ad absurdum of our own positions destroys us. Nobody knows how long we have, under the present system, before some disaster strikes us, more*

> *serious than the destruction of any group of nations. The most important task today is, perhaps, to learn to think in the new way."* (Bateson, 1972, .p468)

From microbial communities to ecosystems to cities and to the whole planetary socio-ecological system, we meet conditions and behaviour that defy reduction to the complicated. The number of possible connections and interactions in any system or network is a power series of the number of components or nodes. It is not just that these numbers become astronomic and super-complicated but they exhibit quite different properties. The richness of these interactions allows for spontaneous self-organisation. For example, flying birds adapt to the movements of their neighbours, unconsciously organising themselves into a flock (Minati, 2006). Such complex self-organising systems are adaptive, which means that they are constantly dynamic and adjusting to the circumstances in which they find themselves. Such systems can also exhibit a relative wholeness, which is identified by emergent properties that cannot be predicted from any one of their parts in isolation. They exhibit properties of adaptive reorganisation in states which have been summarised as being at "the edge of chaos".(Kauffman, 1996)

Holland (1995), one of the key researchers at the Santa Fe Institute complexity science think tank, sums up the nature of complex adaptive systems (CASs). Looking at complex adaptive systems as a whole, he says:

> *"Here we confront directly the issues, and the questions, that distinguish* cas from *other kinds of systems. One of the most obvious of these distinctions is the diversity of agents that form* cas*. Is this diversity the product of similar mechanisms in different* cas*? Another distinction is more subtle, though equally pervasive and important. the interactions of agents in* cas *are governed by anticipations engendered by the learning and long-term adaptation. In specific* cas*, some anticipations are held in common by most agents, while others vary from agent to agent. Are there useful aggregate descriptions of these anticipations? The combination of diversity and anticipation accounts for much of the complexity of cas behaviour. Both seem to arise from similar mechanisms for adaptation and evolution"*
>
> (Holland, 1995,p93).

A strong theme in the field of complexity science is that of order emerging at the edge of chaos. In the world of complexity there is a fuzzy boundary between tight order which offers little scope for change and complete chaos where there is little basis for order. Rather like the region or phase change between a solid and liquid, or a liquid and gas, the possibilities for new emergent patterns reside in that twilight zone. Kauffman's (1996) notion of "order for free" has huge implications for transformative change processes in that authentic transformation necessitates navigating through the edge of chaos to increase the chances of new emergent patterns. However, Stacey's (1996) idea of getting an organization to the edge of chaos so it can respond more creatively is inconsistent. If an organization is a complex adaptive system it must already be at the edge of chaos to be consistent with the nature of a complex adaptive system..

From a different direction of research, Prigogine (1996) realised that there is a time bound process in proceeding from a stable state to add a new pattern. The stable state is in equilibrium, which is equivalent to Kauffman's (1996) initial order. The chaos state is where the system is pushed out of equilibrium. What Prigogine discovered was that in states far from equilibrium new patterns emerged (for example, chemical clocks). This has profound implications undermining any view that the world is in some way predictable if only we could calculate it, as is dominant in the assumptions of the world of complications.

> *"Over the past several decades, the new sciences being born, the physics of non-equilibrium processes, and has led to concepts such as self-organisation and dissipative structures, which are widely used today in a large spectrum of disciplines, including cosmology, chemistry, and biology, as well as ecology and the social sciences. The physics of non-equilibria and processes described the effects of unidirectional time and gives fresh meaning to the term irreversibility. In the past, the arrow of time appeared in physics only through simple processes such as diffusion or viscosity, which could be understood without any extension of the usual time reversible dynamics. This is no longer the case. We now know that irreversibly relates to a host of novel phenomena, such as vortex formation, chemical oscillations, and laser light, all illustrating the essential constructive role of the arrow of time. Irreversibility can no longer be identified with the mere appearance that would disappear if we had perfect knowledge. Instead, it leads to coherence, to effects that encompass billions and billions of particles. Figuratively speaking, matter at equilibrium, with no arrow of time, is "blind," but with the arrow of time, it begins to "see." Without this new coherence due to irreversible, non-equilibrium processes, life on Earth would be impossible to envision. The claim that the arrow of time is "only phenomenological," or subjective, is therefore absurd. We are actually the children of the arrow of time, of evolution, not its progenitors"* (Prigogine, 1996, p3)

The implication of time's arrow for both systems and more generally patterns is critical to this exploration and will be treated in depth by the concept of 'the present moment' in Chapter 8. A key question that emerges in the context of Prigogine's view of irreversible non-equilibrium processes is the relationship between degradation and renewal. It appears that the transition to a new state or pattern goes through a transition phase which is more turbulent and chaotic whether though displacement of equilibrium or, as in Arthur's principle (1990) of positive returns in economics.

> *"In many parts of the economy stabilizing forces appear not to operate. Instead, positive feedback magnifies the effect of small economic shifts; the economic models that describe such effects differ vastly from the conventional ones. Diminishing returns imply a single equilibrium point for the economy, but positive feedback—increasing returns—make for multiple equilibrium points. There is no guarantee that the particular economic outcome selected from among the many alternatives will be the "best" one. Furthermore, once chance economic forces select a particular path, it may become locked in regardless of the advantages of other paths. If one product or nation in a competitive marketplace gets ahead by "chance" it tends to stay ahead and even increase its lead. Predictable, shared markets are no longer guaranteed."* (Arthur, 1990, p92)

Goodwin (2007), working initially with Kauffman at the Santa Fe Institute, questions the basis of reductionist genetic science and arrives by a different route to the notion that a complex organism is irreducible in the nature of biology. This leads him to propose the necessity for a science

of irreducible qualities (the complex world) to complement the science of reductionist quantities (the complicated world).

> *"The term 'a science of qualities' sounds like a contradiction to Western scientific ears, since qualities were banished from science four centuries ago. However all scientific assumptions are tentative and should not be allowed to outlive their usefulness. We are now witnessing the consequences of ignoring qualities in science in the loss of habitat, species, health and quality of life generally,…"* (Goodwin, 2007, p71).

Rosen (1991) tackled these issues from the perspective of mathematical biology and came to the conclusion that life itself, as distinct from specific processes, could not be accounted for by deterministic science.

> *"The question 'what is life?' is not often asked in biology, precisely because the machine metaphor already answers it; 'Life is a machine.' Indeed, to suggest otherwise is regarded as unscientific and viewed with the greatest hostility as an attempt to take biology back to metaphysics.*
>
> *This is the legacy of the machine metaphor. I hope to convince the reader, in the course of the present work, that the machine metaphor is not just a little bit wrong: it is entirely wrong and must be discarded."* (Rosen, 1991, p23)

His view of anticipatory systems is one route into exploring the connection between the nature of system and the nature of time perception. Living organisms, embodiments of the complex world, have the property of 'making themselves': autopoiesis. In Maturana and Varela's definition (, 1980)

> *"An autopoietic machine is a machine organised (defined as a unity) as a network of processes of production (transformation and destruction) of components which: (i) through their interactions and transformations continuously regenerate and realize the network of processes (relations) that produced them; and (ii) constitute it (the machine) as a concrete unity in space in which they (the components) exist by specifying the topological domain of its realization as such network."* (Maturana and Varela, 1980, p7)

A parallel approach to the world of living complexity is that of the idea of the complex adaptive system or CAS. These are systems that involve many components in complex interaction such that they can learn and adapt, and even powerful mathematical tools prove of limited help in understanding them. (Holland, 2006).

Science itself now has frontiers which are immensely complex and have led to quite different relationships between individuals, networks and massive technological research apparatus. (Boisot et al, 2011)

1.4 The Reflexive World

A complex adaptive system with emergent properties and properties of wholes not inferable from the parts does not take us far enough to yet examine the relationship between system and future consciousness. Morin (2008) puts the next step thus.

> *"The observed system – and consequently the organised physis of which it is a part – and the observer-system, along with the anthroposocial organisation of which it is a part, become interrelated in a crucial way: the observer is as much a part of the observed system as the observed system is part of the intellect and culture of the observer."* Morin, 2008, p108

One of the key protagonists of this treatment of systems was Heinz von Foerster (1979) who strongly emphasised that the role of the observer is inseparable from any observed system. He treated the scientific tradition of "objectivity" as a cognitive blind spot and a peculiar delusion. Another aspect of this viewpoint comes from the work of Maturana and Varela (1987) who coined the phrase "bringing forth a world" to point out that what we refer to as a system or a world is only present because in some sense our active perceiving has generated it. Luhmann (2000) applied this idea of second order cybernetics to social systems. Again he challenged the supposition in conventional social science that society is in some way 'out there' as an object seeing it as systems of communication. Societies also exhibited the property of self-observation which itself in modern times is strongly reinforced by the role that media play. He emphasises two perspectives on this:

> *"The first is that the mass media, like any broadcasting system, are operationally closed and, in this respect, are an autopoietic system. The second emphasizes that this is also true of cognitions, because cognitions are also operations and can therefore only be produced in the system. This remains the case even when one considers that in society communication can take place within the system of the mass media from out of the latter's environment, for those communications too are possible only on the basis of the knowledge that mass media have provided. Furthermore, the mass media understand what is uttered to them only on the basis of their own network of reproduction of information. Every communication in and with the mass media remains tied to the schemata which are available for this purpose."* (Luhmann, 2007, p11).

The challenge of second order cybernetics and related perspectives on systems and the nature of things is that it does not sit comfortably with the dominant paradigm of Western science, which could be summed up as reductionism and observer independence. Of course in the world of the very small and the world of the very large this paradigm has been challenged by quantum mechanics and relativity (Penrose, 2000). However, this way of thinking about the world and the nature of our interaction with it have not yet entered the middle ground between the two, where human affairs take place.

Midgley (1996) addresses a related issue through discussing the implications of moving towards an ideal of unification in the system sciences. He makes the point that a balanced pursuit of the ideal of the unity of science can avoid the imposition of a common language and allows diversity to flourish through leaving open multiple domains to be explored in multiple ways.

> *"... pursuing the ideal of the unity of science simply means recognising that this process of free definition may stray into any territory – in principle, nothing is beyond its remit. This does not mean that analyses should be all-encompassing (an obvious*

> *impossibility), but it does mean that systems researchers have an obligation to think critically and creatively about the boundaries they employ."* (Midgley,1996, p28).

From the perspective of the reductionist paradigm this sounds like a contradiction in terms, but there is a significant difference between a closed and an open approach to enquiry.

An important consideration in this view of unification is that it is not an attempt to create uniformity. There is, in a very real sense, a paradox here. This view, summarised by Midgley (2003) as '*theoretically-contradictory eclecticism'* has been explored in some depth by Bowers (2011).

Perhaps an even more fundamental exploration of this territory comes from Umpleby (2014) and colleagues under the term Second Order Science. In their exploration of what second order science might have as guiding principles, they examine such features as the role of the observer, the role of emergence, the role of contextual milieu, the acknowledgement of ambiguity, the place of reflexivity, and the limitations of imposing the assumptions of physics on the other sciences. This latter point was considered very important by Rosen who took the idea from Elsasser (1998).

> *"His argument was, roughly, that anything rare disappears completely when one takes averages; since physicists are always taking averages in their quest for what is generally true, organisms sink completely from physical sight. His conclusion was that, in a material sense, organisms are governed by their own laws ('biotonic laws'), which do not contradict the physical universals but are simply not derivable from them."*
>
> (Rosen, 1991, p1).

The issue of the unavoidable participation of the observer has also led some scientists and philosophers to consider that there needs to be developed a proper science of qualities as distinct from the dominant science of quantities. The latter might say "if you can't measure it, it isn't real" whereas the former would say "if you can experience it there is something real going on". The leading biologist and complexity scientist, Goodwin (2007), investigated different ways of engaging with scientific enquiry, including the role of subjective evaluations leading to intersubjective consensus and subject-subject investigation after the method of Goethe. A related method has been developed by Bortoft (1996) in his phenomenological approach to what he calls real and counterfeit wholes:

> *"The greatest difficulty in understanding comes from our long-established habit of seeing things in isolation from each other. This is seeing things as objects – the bodily world in which separation, and hence material independence, is the dominant feature. No doubt this viewpoint is one which is encouraged by our own bodily experience of manipulating material bodies. But things are not only objects which can be taken in isolation from one another. In fact they are not <u>primarily</u> such 'objects' at all. They only seem to be so when their context is forgotten. What this habit of selectivity overlooks is the way in which things already <u>belong</u> together. Because it overlooks this, the analytical mind tries to make things belong <u>together</u> in a way that overlooks belongingness. It tries to put <u>together</u> what already <u>belongs</u> together. Thus the intrinsic relatedness is not seen, and instead, external connections are introduced with a view to overcoming separation. But the form of such connections is that they, too, belong to the level of separation. What is really needed here is the cultivation of a new habit, a different quality of attention, which sees things comprehensively instead of selectively."*
> (Bortoft, 1996, p290)

One critical aspect of a science of qualities is not to draw an artificial distinction between the nature of the observation and the nature of the observer. Von Foerster (1995) highlighted this very strongly in his piece on ethics and second order cybernetics. This will be examined in some detail in Chapter 4. But in addition to ethical considerations, there is also the question of the observer as thinker, as the generator of interpretive mental models, and the participant in the system whose personal state may have significant effects on the outcome of any systemic intervention.

1.5 Thinking Complexity

In my view, one of the limitations of conceptions in complexity science is that considerations of second order cybernetics, observer participation, transdisciplinary connectedness and significance of the state of the observer rarely get brought into the discussions. This leads to complexity science being treated in the manner of first order cybernetics within the paradigm of reductionism. This limitation can be rectified by considering the nature of complex thought. Midgley (2008) however, points out that any observation is in some sense an intervention and so even reductionism implies a position of interference in the nature of the object under investigation. This will be discussed more fully in Chapter 3.

Despite the considerable contribution to our understanding of the distinction between the complicated world and the complex world made from the evolution of the systems sciences, there is still the risk of treating the next stage of evolution within the paradigm of reductionism. Morin's (2008) contribution is to show that reductionism fragments and therefore evades the full challenge of complexity; and also to show that holism can easily become an abstraction which also does not address the essential requirement of including the observer in the observation.

> *"In either case, reductionist or holistic explanation seeks to simplify the problem of complex unity. The one reduces the explanation of the whole to the properties of the parts conceived in isolation. The other reduces the properties of the parts to the properties of the whole, also conceived in isolation. These two mutually repelling explanations each arose out of the same paradigm."* (Morin, 2008, p101).

Jackson's (2006) creative holism attempts to integrate a composite of diverse mainly first order systems methods with second-order perspective he names total systems intervention. Checkland's soft systems methodology (SSM) takes a strong stance questioning the objectivity of "objective methods" but then in my view does not address the issue of complex thinking as both Morin and Bortoft conceive it.

> *"The concept of system requires the full employment of the personal qualities of the subject in its communication with the object. It differs radically from the classical concept of the object, which referred uniquely either to the "real" or to the ideal. Systems are profoundly related to the real. They are more real because they are more rooted in and linked with* physis *than the old quasi-artificial object and its pseudo-realism. At the same time, they are profoundly related to the human mind, that is to say, to the subject, which is itself immersed*

in culture, society, and history. The concept of system demands a natural science that is at the same time a human science". (Morin, 2008, p107).

The notion of complex thought embraces and interweaves both aspects of part and whole. It is a more insightful context for considering the relationship between the elements of this thesis: time, pattern and perception. The reflexive view adopted here affirms that the state of the human as thinker is critical to the effectiveness of the human as doer. To return to the opening quotation from Stafford Beer, I am basing this work on the principle of correspondence – that we need complex thinking for a complex world and that we have gone past the point where simplification is capable of dealing with the major issues we face. Simplification and specialisation without a complimentary layer of complex thought will surely drive the dynamic of unintended consequences rapidly up an exponential curve. A re-think about the nature and role of thinking (Geersten, 2012) is required.

The five layers of 'thinking into complexity', namely linear analysis, systems concepts, complexity, reflexive systems, and complex thought, all in some way reference a view of the underlying *pattern* of things and processes. These are summarised in Figure 1.1. Each of these five ways of thinking plays a role not only in the theoretical world but also in the practical world. Each of them has an associated set of application tools and procedures.

Reflection on Chapter 1

In my introduction I pointed out that the pathway of this research is exploratory in the context of an emerging second-order science. To be consistent with the philosophy of second order science I, the observer, am an acknowledged component of my observations and therefore my selection and structuring of material in this chapter, indeed the whole book, is coloured by my worldview, aspects of which are revealed by the organisation of material in this chapter.

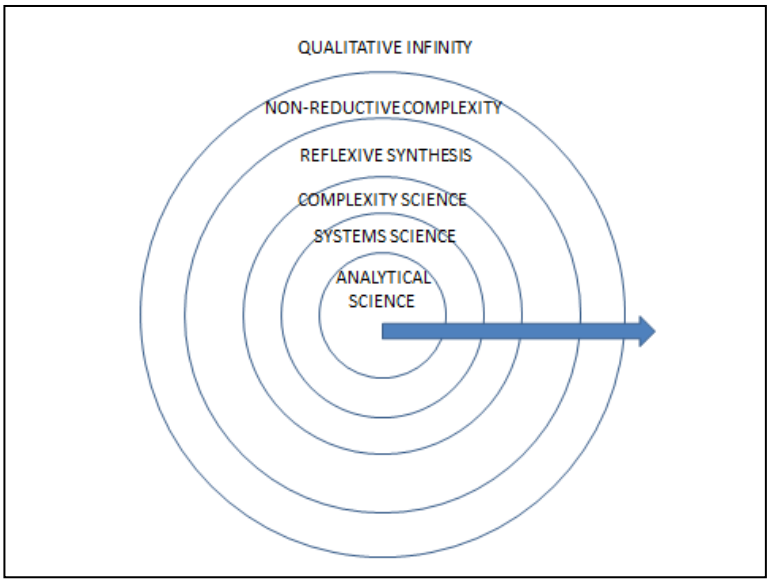


Figure 1.1 – Unfolding layers of pattern thinking

It may appear that the 'layers' shown in Figure 1.1 are a hierarchy or a time sequence. From my perspective they are neither of these but include to a degree some notions of levels and sequence. From a temporal perspective the movement from analytical Cartesian/Newtonian science to reflexive non-reductive complexity does reflect an evolutionary pathway of how we know and understand the world. From a hierarchical perspective each circle within the adjoining circle is a kind of reductionism. But it is important to me that the widest context is labelled 'qualitative infinity': a notion I learned from David Bohm over fifty years ago. Note that it is *qualitative* not quantitative. In the post Hubble telescopic era we are familiar with the quasi-infinite boundary of cosmic space and the uncountable number of galaxies populating that space. Yet that is a quantitative measure that separates and distinguishes, thus is subject to the limitation pointed out by Bortoft in his statement on intrinsic connectedness and is incongruent with what Bohm termed the holomovement (Bohm, 2003b pp85-86).

In summary, and to be explained in greater detail over the following chapters, analytical science is based on the reductionist assumptions of dividing and partitioning, systems science looks both for underlying unities or isomorphies and attributes emergent properties, complexity science also attributes emergent properties, reflexive synthesis implies a crucial role for the observer, non-reductive complexity emphasizes complex thought beyond these. Qualitative infinity reminds us that there is still the great unknown.

So I would rather interpret the progression in this chapter as a parallel unfolding of the implicate order in the world at large as increasing complexity and beyond, and unfolding in the human mind as a corresponding emergence of viewpoints and methodologies. In this respect I do not personally take the view that complexity is the end of the story, as is espoused by many systems scientists. I see it more as a growing appreciation of the vast variety of nature, including human nature. And, to avoid the linear temporal trap, an appreciation that rediscovers ways of being and doing in the world that have a varying but perennial presence in our history. Modern science and recent systems science are tremendous contributions but, as Goodwin (2007) says,

> *"Science evolves in interesting and unexpected ways, like everything else in nature. In the twentieth century the natural dialectic of scientific discovery and understanding underwent a series of dramatic transformations that have now resulted in a window opening on to a richer and more meaningful way of practicing science and participating with the world than we have been engaged in. Questions about the relationships between facts and values and proper conduct in relation to the nature that we have come to understand are now reappearing on the scientific agenda in challenging and urgent ways, after being outlawed from the scientific agenda for four centuries."* (Goodwin, 2007, p23).

So for decision thinking in a complex world we need to become clearer about the nature of the way we see the system of concern that calls for a decision. The context of a dynamic reflexivity is a different decision context from that of a seemingly mechanistic decision context.

******

Chapter 2: Two Approaches – Systems and Futures

2.1 Systems and Futures – A Weak Relationship?

Van der Heijden (2009) makes the distinction that we can describe the behaviour of a system in the time domain or the state domain. A narrative of a series of events describes systems in terms of behaviour over time. A cluster of variables, relationships and models which can apply at any given time is the state domain. In terms of the title of this thesis, 'time' is obviously the time domain and 'pattern' the state domain. He goes on to make the point that knowledge of 'the system' can be approached in either way. From the state domain perspective, various kinds of modelling can be used for simulation exercises to see if they correspond to or illuminate the system. From the time domain perspective, scenarios or stories of the future are developed. Multiple stories are used to accommodate ranges of uncertainty around the 'not yet happened'. This latter approach is essentially multi-perspectival and inter-disciplinary.

Since both modelling the state domain and the time domain are explorations, they are subject to assumptions corresponding to the 'perception' component in this book's title. The original question that triggered this research was based on the observation over many years of practice in both domains that their interrelationship was weakly understood. A question of method was where to begin. The key lies in the meaning of the word 'domain'. Domain means a region with specific characteristics. This implies boundary conditions and assumptions underlying the identification or selection of those boundaries (Lane, 1993). The problem is that rarely are state boundaries and time boundaries considered fully in combination. The starting point I have selected is systemic intervention which pays particular attention to boundaries.

A primary goal of systemic intervention is the improvement of the system in question. The definition of 'the system in question' is often itself a function of multiple stakeholders and is not a fixed object. Boundary critique (Midgley, 2000) can be helpful in clarifying the ambiguity and the power dynamics around agreeing what the system is that is to be improved and for whose benefit. Let us describe some essential features of systemic intervention.

For a given situation in question:

Systemic – attending to wholes, connectedness and non-linear behaviour, with a special emphasis on boundaries concerning who and what is included, excluded or marginalized

Intervention – action taken by a by a change agent

Systemic Intervention – "purposeful action by an agent to create change in relation to reflection on boundaries" Midgley, 2000, p.8

thus aiming to bring about some *improvement,* that is a change for the better by some criterion.

Clearly, what constitutes improvement is a judgement call (Churchman, 1970), and like any judgement call it depends on the stakeholders making it. Midgley and Pinzón, (2011) point out that one of the most critical judgements prior to settling the specific meaning of improvement in a given case, for example in conflict resolution, is the determination of the boundary of the system.

Figure 2.1 represents a simple, basic form of boundary critique for a single stakeholder, or where there is agreement between multiple stakeholders. The outer broken line determines the boundary between what is perceived as relevant to the intervention and what is considered irrelevant. The inner broken line represents the negotiated agreement as to the system in question, which is subject to the intervention. The peak represents the 'centre of gravity' of the sense of identity and underlying values that make the system in question meaningful. In the case of stakeholders in contention, it would be necessary to use several of these diagrams with degrees of overlap. For a development of this approach see Midgley (2000) and Midgley and Pinzón (2011). An important element of boundary critique is not taking boundary judgements for granted, but comparing and contrasting different possibilities for setting boundaries, in order to explore the likely consequences for stakeholders and the issues that concern them (Ulrich, 1983).

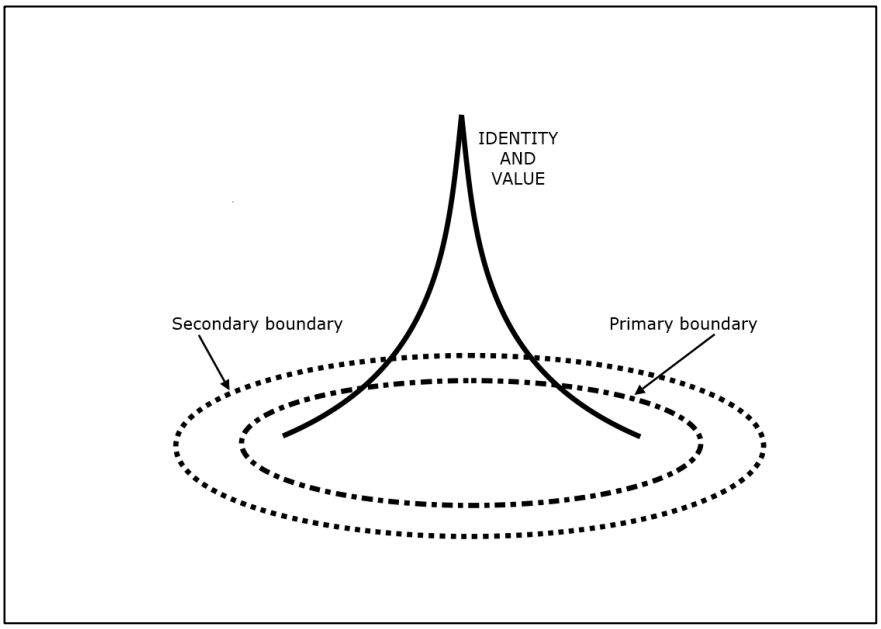


Figure 2.1 – Basic form of boundary critique

The boundaries represented in the above exposition are essentially about content, and tend to be spatial and semantic in character; who and what is included or excluded. Mapping boundaries helps to surface assumptions and clarify agreement about what is in and what is out of the system in question. There is another boundary, not usually considered as such, which is time. This Chapter will review the nature and degree of coupling between considerations of system (pattern) and time span. These areas will be reviewed in Sections 2.1 and 2.2 of this chapter.

Foresight practitioners consider 'temporal windows'. Typically, forecasts tend to adopt either short windows (econometric models project between 6 to 24 months into the future, and strategic planning usually proceeds in 5 year steps) or very long windows (80-100 years, such as when forecasting climate change). Foresight authors often use the term 'looming issues' (Kelly et al, 2002) for the middle region of around 10 years, where more established futures methods show diminished effectiveness. Thus *"...businesses must learn to anticipate and adapt more quickly to an increasingly complex environment in which many political, economic, social, cultural, and technological forces are shifting, interacting, and even colliding"*(Kelly et al, 2002, p3).

The rest of this chapter will survey evidence for the nature and relationship between systems thinking and futures thinking. Certainly there have been excursions into this territory, but the literature reveals relatively scant connection between the two areas and these generally appear to be additive rather than pursuing the implications further. Futures work in the form of scenario planning has not generally been viewed as taking place within a context of systems thinking. Similarly systems thinking methods have not generally been placed in a context of futures thinking. This finding is consistent with my personal two decades of practicing in both fields and witnessing the approaches of practitioners.

Where a system method has been applied in, say, scenario planning, it is generally to assist with the structuring of scenarios, especially the narrative structure of scenarios and enabling clearer distinctions to be made to alternative futures within a scenario set (Hodgson, 2007). However, there is a view that, without scenario planning being carried out within a context of systems thinking (as distinct from applying it as a tool), scenario planners are weak in articulating their assumptions regarding the interactive context of the scenarios and the boundary conditions which they are applying by default. In my experience as a scenario planning consultant over two decades, this often means that critical issues affecting the possible future are left out of consideration. There are several possible reasons for this, but perhaps one of the most powerful is the psychological mechanism known as 'defensive routines' (Argyris et al, 1985). The essence of scenario planning is to reveal assumptions that, if unexamined, are likely to lead to strategic breakdown or missed opportunity. Without processes and praxis to tease out these assumptions and to facilitate the psychological challenges of revealing and confronting 'elephants in the room', scenario planning may not be as robust as it is often painted (Michael, 2010).

Where futures thinking has been applied in systems work it is largely implicit. For example, the notion of *improvement* implies that, compared to the present system-in-question, any improvement is aiming to lead to a change for the better in the future system-in-question.

Scenario planning naturally makes assumptions about time. In a comprehensive review of scenario techniques, Bishop et al (2007) refer to time in a variety of ways. For example

- the future is uncertain so we must prepare for multiple, plausible futures

- we must consider timescale: long-term versus short-term
- we can do time series analysis with systems models
- we can do multiple time series with divergences mapping
- we can estimate the timing of impact of key events

The closest relation of time to systems is in the use of event sequence mapping and dynamic simulation of behaviour over time. The emergence of micro-worlds to simulate different futures given different assumptions in the manner of a "flight simulator" illustrates this (Morecroft, 1988).

According to Miller (2011), going beyond the above methods requires us to take a stance of prioritising ontology over epistemology: scenario methods, despite tackling uncertainty, still assume a deterministic ontology and leave little room for the notion that the future is *inherently* unknowable in certain aspects. Commenting on Ogilvy's (2011) notion of 'the scenaric stance' (described in Section 6.2), Miller sets a helpful context for his investigation:

> *"In my view the "scenaric stance" is only workable, at least given the current context, if it's practice is based on a resolutely indeterminate ontological starting point that excludes any probabilistic treatment of the future of complex phenomena and an anticipatory systems framework that provides the basis for making sense of the anticipatory processes as both animate and inanimate phenomena."* (Miller, 2011, p26)

Fuenmayor (1997) grapples with the issue of reframing systems thinking in a similar philosophical way in his critique of soft systems thinking:

> *"What is then the (historical) meaning of our present systems thinking? How can the notions of holistic critical learning suggested by Vickers' metaphor of the "trap" match with that of "accommodation"? Is it the last echo in a land of the deaf of the will to liberation? Is it a strategy to further confuse the dying discourse of Modernity and its liberating project? Or, is it rather the beginning of a new, a totally new, as far as our historical memory reaches, way of systems thinking?"* (Fuenmayor, 1997, p16)

2.2 Systems and Futures: an Overview

The systems literature has some evidence of the presence and application of techniques from futures studies and scenario planning. To set the scene for this analysis, a deeper examination of the assumptions at play in both modes of thinking is needed. Taken in its broadest sense, 'systems thinking' includes a very wide range of concepts, theories, methodologies and methods (Midgley, 2002). Searching for any occurrences in the futures literature of any type of systems or boundary thinking applied in the futures field reveals a relatively small number of references. Similarly, there is a wide range of concepts and methods used in future studies, but the search reveals that only a small number of examples of systems work can be found in the futures literature. The expression "small number of examples" is relative to the total scope of the field under review.

The schematic of my literature review are depicted in Figure 2.2. At this stage of inquiry this is not a well-defined classification but simply a conceptual tool to enable the different fields to be

searched. What emerges from the search is more complex and intertwined than this preliminary classification would suggest but this proved useful as an interdisciplinary opening.

Futures as Context	Systems as Context
systems in futures Weak←?→ Strong	futures in systems Weak←?→ Strong
boundaries in futures Weak←?→ Strong	boundaries in systems Weak←?→ Strong

Figure 2.2– Four areas of investigation

The left-hand column searches the futures field to find evidence of systems thinking and application of some type of boundary thinking. The right-hand column searches the systems field to find evidence of futures thinking and the application of boundary critique. The topic in each box will be described below. In each of these categories represented by the boxes the evidence for connection might be weak or strong. The literature review is to ascertain this.

2.2.1 Application of Systems in Futures

Prominent in relating futures to systems thinking is the work of Ackoff (1974) on the theme of redesigning the future. In the planning field he developed a method called interactive planning (Ackoff, 2001). He also worked with large corporations in advancing the way they think about not just anticipating the future but creating it (Ackoff, 1981). The viable system model developed by Beer (1985, 1989; Espinosa and Walker, 2011) particularly emphasises the importance of a systemic viability function concerned with the wider environment and the looking to the future to ensure capacity to adapt to a changing environment. (For a fuller account see Chapter 14, Section 2).

Two major applications of systems thinking in futures work are causal loop modelling and system dynamics. The latter is the use of systems models which themselves can generate alternative scenario outcomes depending on how the key inputs to the model are set. A well-developed form of this is the creation of micro-worlds. Morecroft (1992) reported on in Bunn and Larsen (1997), describes working with a group of Shell executives developing an oil simulation game in which the players are challenged to run oil companies in the context of different global scenarios. Soft systems methodology (Checkland, 1990) has also been applied in scenario work (Lang and Allen, 2010). Another is the use of causal loop structures to bring out the differentiated underlying structure of each scenario in a set. For example, I applied basic causal loop models to differentiate four scenarios exploring the next 50 years of intelligent infrastructure (Curry et al, 2007). The approach is shown in Figure 2.3. (Hodgson, 2007).

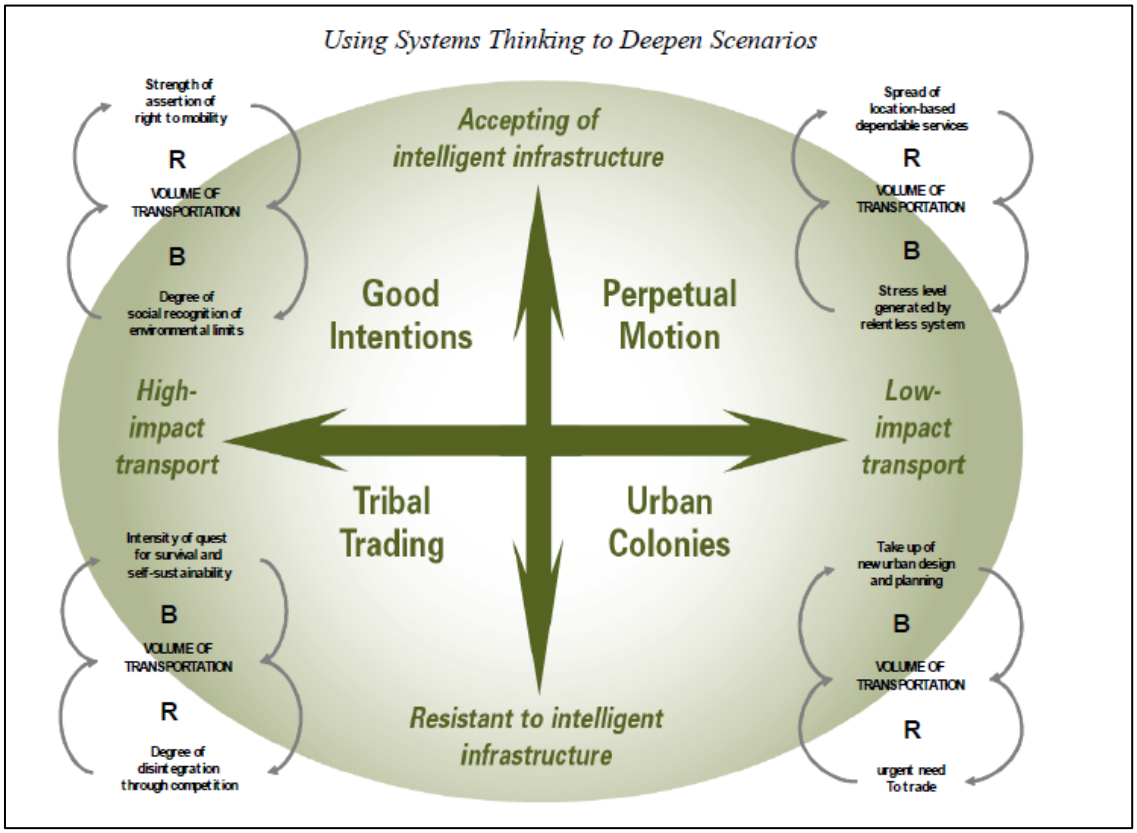


Figure 2.3 – Application of causal loops to a scenario set

In this diagram two major uncertainties were distilled out of the preliminary work, and these were characterised as (i) the acceptance or resistance to the adoption of intelligent infrastructure by society (the vertical double headed arrow) and (ii) the high impact or low impact of the transportation infrastructure on society and the economy in general. Combinations of these alternative resolutions of uncertainty generate the four scenarios indicated in each quadrant. Although this frames the four scenarios as distinctive, a problem is that when the scenarios are actually used, for example in 'wind tunnelling' policies, there is a tendency for people to become confused as to where they are imaginatively located in the scenario space. This is where the causal loop thinking is helpful.

Applying causal loops proceeds in the following way. Depending on the interest of the user group, a key central variable of interest to the user group is chosen. In this case it is the volume of transportation. Analysis may speculate on numbers for each quadrant, but this says nothing about the drivers and inhibitors that dynamically create and stabilise the volume of transportation. Study of the details of each scenario suggest that each required a dominant reinforcing loop that would drive up the volume of transportation, and each had a complimentary balancing loop that would inhibit or slow continuous exponential growth. The character of the reinforcing and balancing variables in each quadrant reflects the distinctive narratives generated in that quadrant.

In practice, this gives the participants and the facilitator of an intervention basic anchor points to keep the group in the right future for that stage of the process. It helps to combat drift by placing the dynamic loops as central to the narrative of the scenarios.

Core and major causal loops

The critical role of infrastructure, in society and the economy, captures investment in the 'sustain the legacy' loop. Even though this enables more and more loading on the system, expansion becomes constrained, increasing public concern over environmental impact, which energises a restraining 'green value shift' loop. This is a scenario of well-meaning action with unintended consequences.

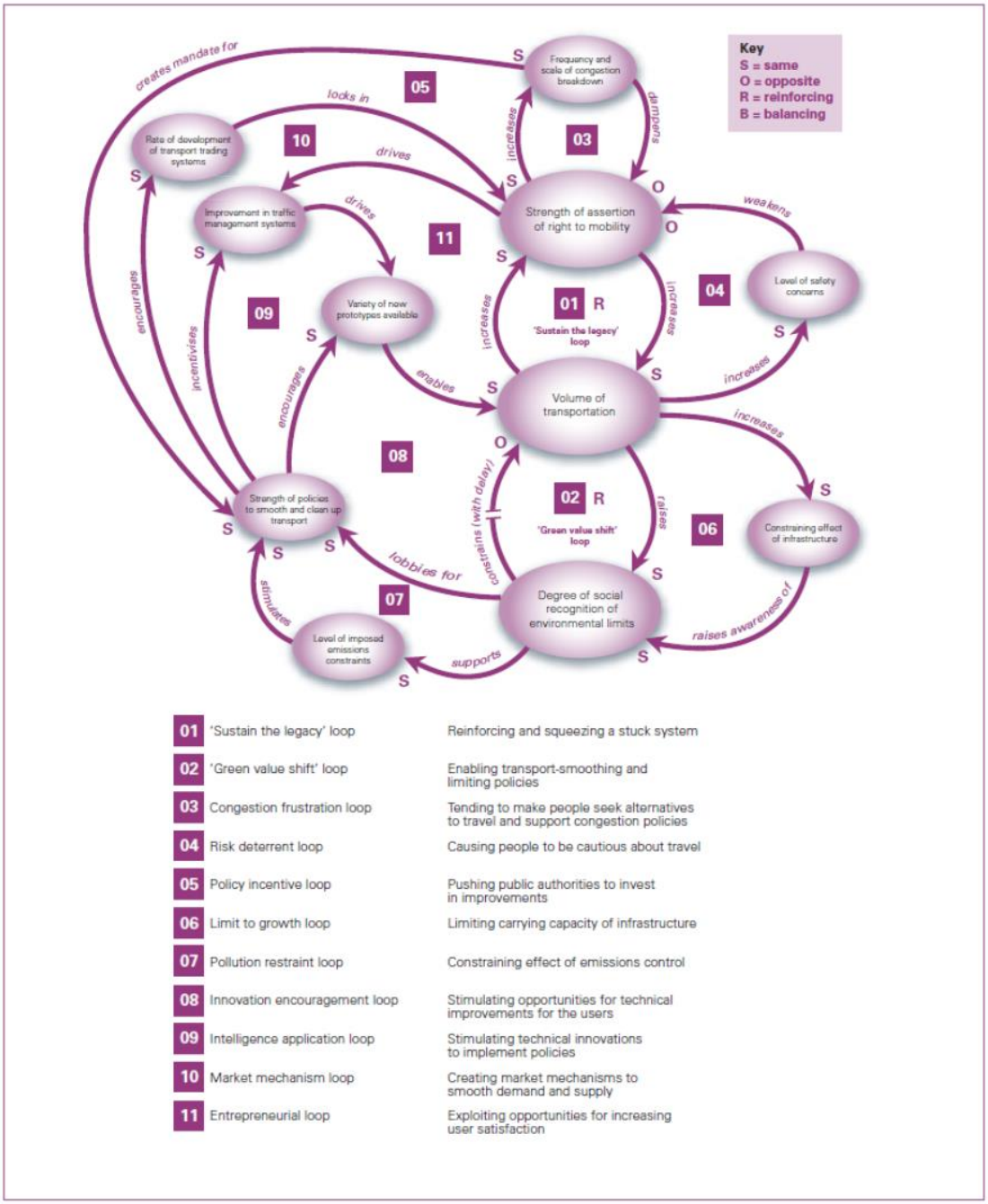


Figure 2.4 – Narrative extension of the basic causal loop diagram (Curry et al, 2007)

An interesting feature of this technique is that each core system can be elaborated with subsidiary variables linked in various ways according to the data and the speculation of the experts involved in the exercise. These more complex causal loop diagrams can in turn serve as a basis for creating narratives that again help people to appreciate the story of the scenario evolving over time. To illustrate this, Figure 2.4 shows the more elaborate causal loop diagrams developed for one of the scenarios; "perpetual motion". For the related narrative, refer to the original document.

Winch (1998) has used system dynamics to assist a form of dynamic provisioning for dynamic environments. This uses the stock-flow diagramming approach to capture the basic variables and relationships in the area of interest. He claims the strength of this approach is that it:

> *"... provides a way to investigate the stability of, and the transitions between, the individual snapshots of the future utilised in other scenario techniques. These snapshots or temporary equilibria – some of which may be very short-lived others possibly more enduring – may be viewed as representing calms in a storm of change. Qualitative system dynamics using causal-loop/influence or stock flow diagrams provides a way to aid the understanding and articulation of the relationship between system structure and probable behaviour." p360*

In reviewing the whole field of futures studies looking for evolutionary trends, Kuosa (2011) incorporates aspects of systems thinking into his schema as shown in Figure 2.5. However, he limits his interpretation to the modelling of dynamical systems arising from an engineering orientation. He sees the next phase of future studies being a paradigm based on dialectical thinking, critical and integral futures studies including macro-historical analysis, the use of inferential methods and confronting paradoxes. The idea of systems thinking, particularly in the sense of overall critique, does not appear in his review. However, there is clearly a space opening up here for stepping beyond mechanistic, predictive forms of system thinking and introducing the importance of choices about values and boundaries.

Kuosa (2011) summarises interesting observations about the problem of deterministic prediction in a world of complex emergence made by Snowden in 2002 at a symposium in Singapore held in 2010

> *"According to Snowden's presentation, the key errors in Western control-based thinking and foresight are related to pursuit to control something. For too long we have been taught to avoid failing. However, in real life, people who do not fail, do not live. Hence, it is most important to accept failing. Otherwise there is no development and dynamism. And it is better to understand present in its evolution, if you cannot know about the future and be prepared to it. Thus we should look evolutionary possibilities, not a range of outcomes. We should use more dialectics than dichotomies, and paradoxes instead of dilemmas, as Paradox method helps us to think in a very different way":*
>
> (Kuosa, 2011, p334)

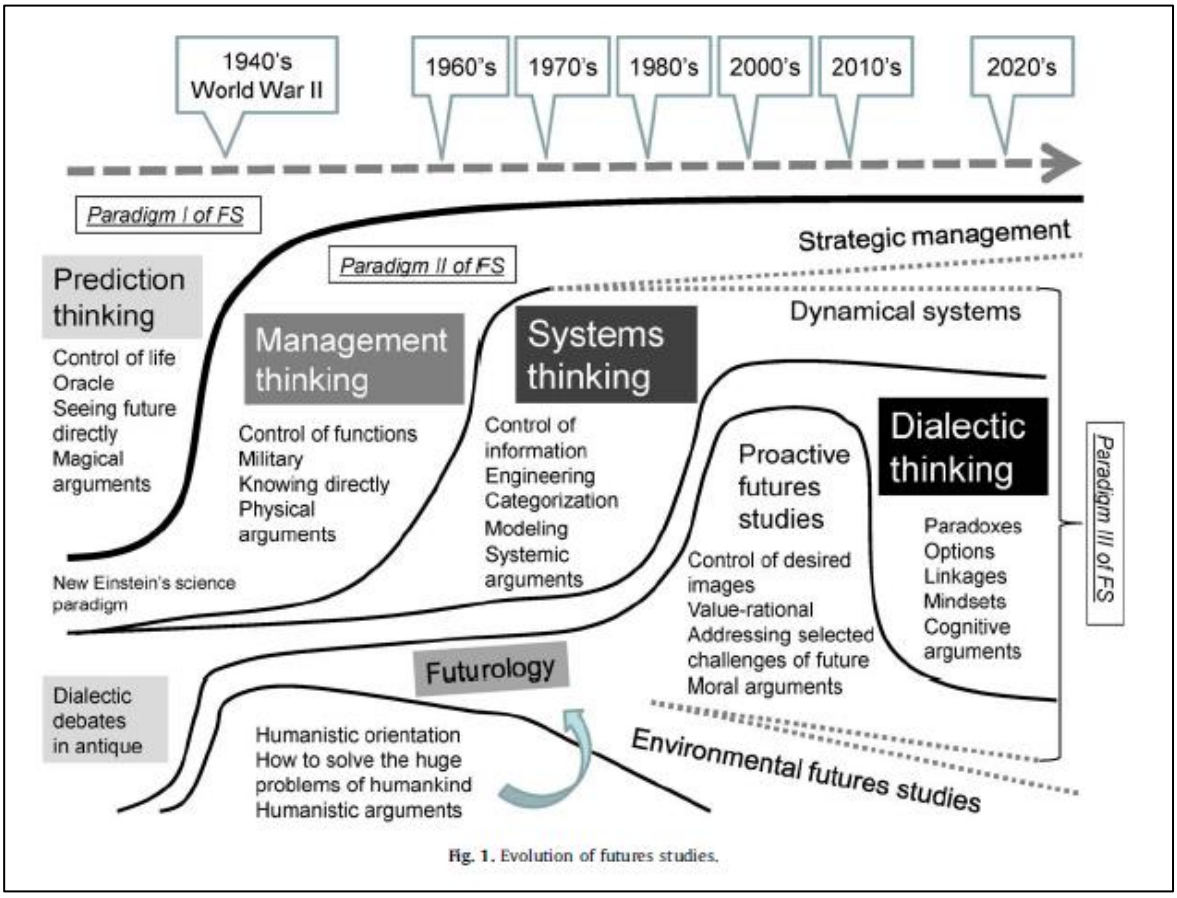


Fig. 1. Evolution of futures studies.

Figure 2.5 – Summary of the evolution of futures studies (Kuosa, 2011, p333)

A pioneer in relating consciousness and perception to rigorous analysis in the development of futures scenarios was Pierre Wack. Burt (2010) has re-examined what Wack (1985) referred to as "the gentle art of re-perceiving". Burt makes the point that the role of scenarios is to help managers gain a fresh perspective about the interplay between factors, actors and variables in the business environment. Assumptions are challenged by exposing new and previously unrecognised driving forces. The idea is for the scenario process to stimulate new understandings which challenge the legitimacy of existing assumptions. In reviewing the evolution of scenario methods, Burt includes the development of simulation and dynamic modelling to explain systemic structures in scenarios and refers to the introduction of feedback loops, behaviour over time graphs and influence diagrams to describe these dynamic structures, also referencing Hodgson and Sharpe (2007).

2.2.2 The Application of Boundaries in Futures

Classical management thinking, in considering foresight, shows little evidence of considering boundaries as a major conceptual factor. Stark (1961) summarises a classical definition of foresight. Note no reference is made to context and boundaries. However, Stark does emphasise a role for 'creative temporal foresight' in his review:

> *"The specific objectives of the remainder of this paper, then, are to recommend a definition of foresight; to place this definition within a conceptual framework that includes time, future, prediction, subjective probability and logical and empirical possibility and impossibility; and to suggest the business importance of foresight as herein defined."* (Stark, 1961, p33).

The notion of boundaries figures much more prominently in contemporary management. In the so-called 'new economy', seemingly stable rules and boundaries have been breaking down sufficiently that writers have had to take them into account. For example, Hamel and Prahalad (1996) point to a range of situations where boundaries have been reconsidered. These include the domains of authority, within functional hierarchy; loyalty and affiliation; the rules of competition; and between the physical and the intellectual. The impact of these changes raises a key question: *"Shouldn't authority be as much a function of foresight as of hindsight? In a world of discontinuous change, shouldn't authority rest not only on experience, but also on the capacity to learn and adapt?"* (Hamel and Prahalad, 1998, p240).

However, at this time, they did not directly address the question of foresight. In the field of futures studies itself, implicit consideration of boundary thinking emerged from leaders in the field like Jim Dator (Dator and Marsella, 1979). Candy (2010) summarises Dator's four types of story in futures work. I consider that each story type implies an orientation to setting boundaries, although perhaps not explicitly.

> *"First, there are stories of a future of continued growth, in all the key social, and especially economic, indicators. These are traditionally dominant in Western society, closely associated with the historical myth and meta-narrative of indefinite linear progress.*
>
> *Then, as counterpoint to the anthem of continuation, and coming from the growing numbers of those who discern that indefinite continued growth within a finite system is impossible, there are stories of collapse; a tear in the fabric which brings 'progress' to a standstill, or sends society reeling 'backwards'.*
>
> *Third, since continuation is not possible, and collapse is not desirable, there are exhortations to adhere to certain standards, or values, or constraints: this is the disciplined or 'conserver society' future.*
>
> *Finally, there are stories about future society in which something drastic and unprecedented happens to shift our historic trajectory, a game-changing alteration, at the level of one or more of our fundamental assumptions: a transformational image of the future."* (Candy, 2010, p47-48).

Although Candy's doctorate was in political science where one might have thought explicit boundary conditions would be articulated, the discussion did not address the issue.

Reviewing major contemporary authors in the futures and scenario field (Godet, 2001; Slaughter, 2004; van der Heijden, 2005) did not reveal any use of the term boundary as part of the futures methodology. However more recent work by Burt and van der Heijden (2008) shows significant movement in this direction by drawing on Vickers' appreciative system notions. They relate this to a model of interactive learning:

> *"… reality judgement, is based on sense-making of the situation, which itself is based on an understanding of the state of the system that is of interest to the problem owners. The state of the system is changing constantly and an individual's perception and understanding of their organisation's changing context will therefore always be subjective and limited, constrained by bias and bounded by experience. Individual perceptions within a group will also be multiple, partly divergences and partly overlapping. Given such circumstances groups of individuals engage in a process to share and discuss their different perceptions…… Such a process requires structuring and restructuring of perceptions, based on negotiation and agreement of meaning, and alignment or accommodation of diverse views."*
> (Burt & van der Heijden, 2008, p1112)

This way of framing a futures study leaves only a short step to a futures-oriented form of boundary critique[2].

2.2.3 The Application of Futures in Systems

There are two basic ways in which futures thinking shows up in the context of systems thinking and systems modelling. The first is where simulation modelling is used to explore possible future states of the system which are generated by different values of the variables operating in different dynamic causal relationships over different time periods. This approach is basically in the context of "hard" systems thinking. The second is where systemic methodology is applied to generate some kind of improvement, which is implicitly referencing a future state of the system or situation. This approach is basically in the context of "soft" systems thinking.

Morecroft (2007) describes a good example of the first type in his chapter on industry dynamics. Using system dynamics modelling of stocks and flows he creates a simulation tool.

> *"Having described the conceptual building blocks and feedback loops of the oil producers' model we are now ready to simulate scenarios. The key to effective scenario modelling is to unfold several alternative futures (each an internally consistent story, but with a different plot and a different ending) in order to challenge conventional wisdom and to encourage users to think how they would act if this future were to unfold."* (Morecroft, 2007, p285).

The generic development of this application of system dynamics has come to be called Microworlds. The term, originated by Papert and adopted by SD practitioners, is used for software simulation used extensively in education.[3] Warren (2002) develops an extensive application of system dynamics modelling of resources to the construction of strategic architecture and strategy development. He points out that by modelling scenario generating structures it is possible to gain insights into the scale and pace of change in industry evolution. This is something that the more static "images of the future" type of scenarios cannot deal with. The basic notion here is that, with systems modelling, strategic thinkers can rehearse future possibilities to challenge the integrity of their

[2] See Chapter 2.2.4 for an explanation of boundary critique

3 (see http://www.microworlds.com/solutions/mwex.html for examples)

strategic ideas and plans. For example, commenting on the clash between two rival technology standards in telecommunications he comments:

> *"There was always going to be a limit to the certainty with which France could anticipate the consequences of these contrasting conditions between the two markets. Such uncertainties are the norm rather than the exception, especially in emerging industries and sectors, so the resource-system perspective provides an integrated framework where the interplay between such uncertainties can be rehearsed. This rehearsal will generate many scenarios for the future, each with its own coherent story, its own contingencies, and its own degree of plausibility. Management can then make various uses of the model and its alternative scenarios."* (Warren, 2002, p299)

In this sense perhaps the core relationship between systems and futures is implicit in the notion of simulation. Sterman (2000) treats modelling as embedded in a cycle of learning in which an important role is played by rehearsal of the future:

> *"Pilots step into an aircraft flight simulator and learn more quickly, effectively, and safely how to operate the real aircraft, then put the skills to use in the real thing. They feed back what they learn flying the real thing to the simulator designers so the simulators can be continually improved. What pilots and designers learn in the simulator is used in the real world. And what they learn in the real world is used to change and improve the virtual world of the simulator. So it is with management flight simulators and system dynamic models."* (Sterman, 2000, p. 88)

Soft systems methodology (SSM) is an example of the second 'soft' kind mentioned in the first paragraph of this section.. Checkland and Scholes (1999) describe a cyclical process (Figure A1 on pA9) in which the emphasis is not on the model per se but on multiple models of purposeful activity which lead to an accommodation between different interested parties that then can promote action to improve, which in turn feeds into the perceived real-world problem situation. Although there is no explicit discussion of futures or scenarios, it is clear that any action to improve is purposefully directed towards a future situation. Admittedly this is more in the sense of a "make happen" rather than a "might happen".

This approach is illustrated by Bustard et al (2000) in engineering. They begin from the idea of improving a business using SSM as a means to develop a vision. This is combined with a technique called use-case modelling. The term 'scenarios' is used in a rather restricted engineering sense of 'event action sequences' that describe possible system behaviour.

Some references to futures thinking occur also in approaches to systemic resilience. Wright et al (2012) use SSM concepts to consider a range of root definitions for resilient systems. For example:

> *"A system to identify possible hazards, disruption and stress by imagining and developing scenarios of what may happen or be achieved and assembling this intelligence together with intelligence about historical events and lessons learned and storing, processing and making available this information as required."* (Wright et al, 2012, p49).

In some systemic interventions using problem structuring methods use has been mad of a rich picture approach to depict possible futures beyond the current problematic situation (Foote et al,

2006). A recent development by Scolozzi and Poli (2015) is to extend the frame of system dynamics to include anticipation thus linking it with Rosen's (1986) anticipatory systems ideas incorporating the idea that futures states may determine present changes of state. Anticipatory systems are explored in more depth in Chapter 10.

2.2.4 Application of Boundary Concepts in Systems Thinking

A recent review (Mingers and White, 2010) of the application of systems thinking to operational research and management science covers a wide range of contemporary schools of thought. Inadequately, the only reference to the concept of boundary was to the works of Ulrich (1983) and Midgley (2000). However, much is now developing in the area of boundaries and systemic intervention coupled with other systems methods. One example is the work of Yolles (2001) in developing viable boundary critique in relation to the viable systems model (Beer, 1985).

The development of boundary critique (Midgley et al, 1998) opens up the field of considering boundaries in relation to systemic interventions. However, despite the expanding application of boundary critique and its methodological companion, critical systems heuristics (Ulrich 1983), there is little evidence of its application in other areas of the systems field. I conjecture this is partly due to the very nature of boundary critique, in that it questions many of the convenient assumptions of other methodologies, especially in relation to values. For example, Cordoba and Midgley (2008) develop this approach in relation to information systems

Boundary critique is based on a number of principles. A good starting point is the proposition that there is no such thing as a value-free definition of a system boundary. How we see what is inside and what is outside a system is a combination of analysis of a situation and a judgement about what is significant. Especially in complex situations, a key question is 'what is the system in question?', and there is no one right answer – it depends on the value judgements being deployed.

We then need to recognise, especially in human social situations, that there are multiple stakeholders who bring different value judgements as to what ought to be defined as inside or outside the system (Ulrich, 1983). Without a praxis of boundary critique, these differences are resolved by power relations alone. For example, a senior manager in an organisation commissioning a systemic intervention, or an 'expert' consultant, might make a unilateral and unreflective decision on boundaries. Power in this case is not distributed among all stakeholders (including those who are likely to be affected by the outcome of the intervention), and so some are marginalised (Midgley 2000 pp142-152). What boundary critique brings to bear on this difficulty is an intentional practice of reflection: *"a capacity to reflect on different possible boundaries is essential if we are not to simply take for granted assumptions flowing into the intervention"* (Midgley, 2000 p135).

The drawing of the boundary is open to question and discussion, and hence to the surfacing of assumptions that are influencing different stakeholder's positions. The results of this reflection are that more information is likely to be gathered (swept in) (Churchman, 1979), which increases the

variety of the system. Also, issues of domination and marginalisation are more likely to become explicit through boundary critique; and interventions have more possibility of generating *emancipatory* improvements, rather than just 'improvements' that are only seen as such from the perspective of the powerful (Ulrich, 1983).

Ulrich (2000) illustrates this very well in his discussion, for example, of reflective practice in civil society. He points out that the basis of legitimacy in a civil society resides in the citizens themselves. Distinctions, however, are made between elected representatives, the politicians; the experts or professionals; and the many persons affected by policies and decisions. In this common social structure, citizens are treated as incompetent and therefore marginalised from decision making. Consultation, if it exists, is largely token and more an attempt to placate people than enable meaningful participation. The real issue in this case is that those in power draw the boundary, often held in place by one-sided legal frameworks that exclude the values and potential inputs of those affected by the policies or decisions. Ulrich proposes an approach that he calls 'critical systems heuristics' (a summary of this approach can be found in Ulrich, (2005) to rebalance the power relationship. In this approach, the citizen is included as an equal voice in considering what is in and what is out of the system in question.

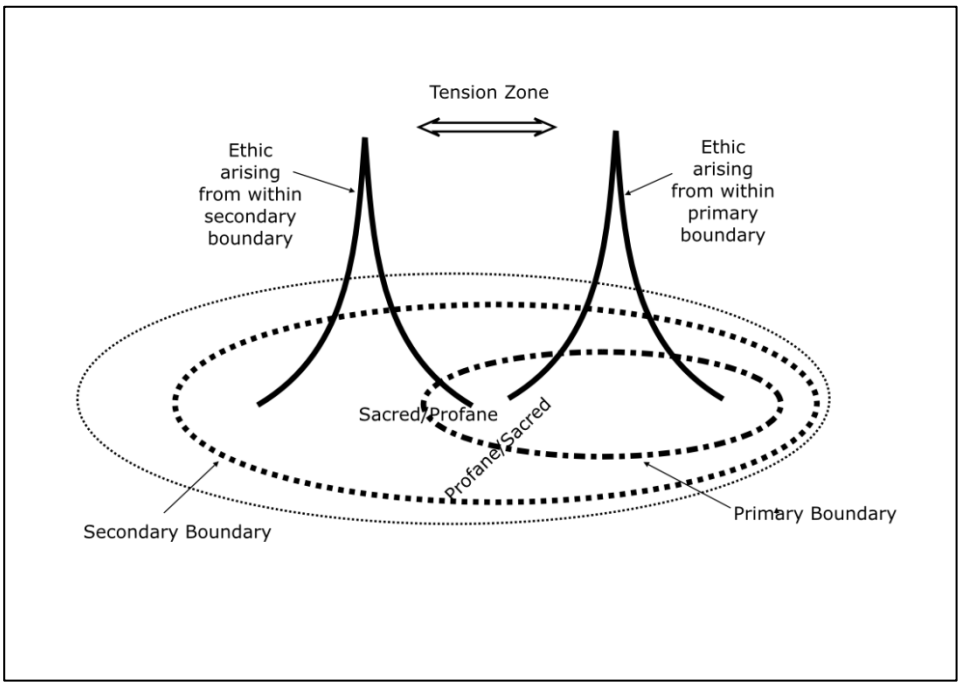


Figure 2.6 Boundary critique with clashing ethics (adapted from Midgley 2000 p144)

Midgley (1991, 1992; 2000, pp153-154) takes this approach further by providing a visual mapping language to represent the boundary judgements of two parties with a common focus of concern (represented in Figure 2.6). Suppose one party makes a value judgement on the system boundary which is widely inclusive and the other party makes a narrower judgement; there will be a gap between the boundaries. This gap indicates what is marginalised by the narrower judgement.

Those who are more inclusive will see the marginalised as 'sacred', and those with a narrow focus will view the marginalised as 'profane'. Thus, what is marginalised is in contention. In the absence of dialogue about the ethics and nature of this contention, rituals of suppression are developed which allow one boundary judgement (often, but not always, the narrower one) to dominate. These rituals can sometimes come to be so taken for granted as to render the differences of perspective virtually invisible or undiscussable.

Ulrich's (2000) approach to rendering things discussable is to introduce a reflective practice that questions four types of assumption; concerning motivation, power, knowledge and legitimation. Each of these has three questions associated with it, making a total of twelve questions in the practice. Since a great deal of my experience has been as a strategy facilitator working with teams in corporations, I will reflect on my experience using Ulrich's conceptual framework of his 12 questions, reflecting his framework clarifies of aspects of the practice skills that I have developed over the years.

1. *Client*: often the contractual client was acting for someone of greater power who had delegated the action – this of course often put them outside of the boundary of concern with deleterious results.
2. *Purpose*: often the ostensible purpose (for example to challenge a strategy) was not the covert purpose (which was to confirm an existing strategy) which was to support vested interests.
3. *Measure of Improvement*: this was often a confused area since the boundary could be around a workshop itself, around the reports of the participants, on the impact on the decision making and ultimately on the longer term bottom line. All of these had huge ambiguities.
4. *Decision-Maker*: usually the decision makers distanced themselves from projects using the conventions of delegation and recommendation to justify this (i.e., they preferred to have their subordinates participate and make recommendations so they could reserve the right to veto decisions without being pressurised by participants). The absence of their participation could be just as frustrating as the absence of those affected by the decision.
5. *Resources*: even senior decision makers were embedded in 'higher level' struggles and contentions in the organisation and therefore often could not execute with the 'authority' they notionally held in an organisation.
6. *Decision environment:* the client often drew the boundary around the intervention that excluded the decision makers and therefore seriously disempowered the possibility of implementation that would have come from the decision makers being exposed to workshop dialogues.
7. *Professional*: facilitation methods (such as hexagon mapping, Hodgson, 1992) are designed to enhance participation and listening. Some clients were often disturbed by the facilitation principle that "all voices will be heard", independent of status. The value of hexagon mapping

is that it gives and explicit framework to legitimise this process and demonstrate its added value.

8. *Expertise:* often a key to successful intervention was the identification and inclusion of people with a requisite variety of expertise and experience. This was especially the case in creating scenarios for strategy development and testing.
9. *Guarantee:* who is assumed to be the guarantors of success was as far as possible set up to be a collaborative commitment between the consultant (myself), the client and the participants. The facilitation task included the cultivation of joint ownership for outcomes.
10. *Witness:* the more promising projects always included a round of interviews much wider than the executive team in order to draw in the perspectives and interests of other stakeholders. However, this was still mainly constrained to those still within the formal organisation. An exception was in some scenario planning where the principle of incorporating 'remarkable people' wasevoked to ensure diversity of perspectives.
11. *Emancipation:* in corporate settings this was rarely raised as discussable due to the predominant command and control cultures. However, especially in a research setting, there was much more interest in, for example, bringing in junior people to innovative projects so that they could make their contribution.
12. *Worldview*: corporation managers all subscribed to the industrial and commercial profit worldview. Of course there were wide variations within this, depending on the specific culture of the organisation. This world view often constrained the boundaries to be drawn, excluding the effect of the organisation on the wider environment or treating these as externalities to be managed and minimised. This condition is often very clearly revealed in what issues a client will include and avoid in scenario planning.

However, CSH and similar approaches, although they can deal with differences of viewpoint and, to some extent, conflict, have been challenged. This is especially so in relation to the claim that they can help in situations of coercion (Flood and Jackson, 1991), or situations where not even third parties can develop sufficient trust with either party to enable some exchange and debate. For methods like CSH to work people must first be willing to come to the table.

> *"Coercion, by definition, involves people disengaging from debate and exhibiting dogmatic intransigence, or even violence. Once people have taken a coercive path, they are unlikely to submit to negotiation or arbitration as long as their interests are satisfied through the continuation of coercive activity"* (Midgley, 1997, p38).

However, there is an increasing application of systems thinking to action research where the concept of systems boundary is used. For example, a boundary judgement needs to be made that distinguishes the system of interest. The borders of the system are determined by the observers and where they feel control action can be taken. Ison (2008) also points out that different

observers/participants in the system may make different boundary judgements as to what constitutes 'the system'.

In system dynamics there is some consideration given to the boundaries of the system in question but not particularly from the observer/practitioner point of view. For example, Wolstenholme (1993), in a system dynamics (SD) project on community care, make the observation:

> *"What SD process mapping can contribute to a rich picture is a formal mapping tool which can be used to see how people, organizational boundaries, delays and policies combine with process to create organizational behaviour. It is in doing the latter that the concept of feedback and simulation are introduced."* (Wolstenholme, 1993, p. 36).

The case for boundary thinking in the systems field has been well developed by Midgley (2000, 2011) especially in the context of interventions for the purpose of improvement in a situation. It is worth emphasising again that, in the systems field, perhaps futures thinking enters in disguised as overarching concern for an improvement which clearly is yet to come and therefore in the future. The time span of such improvements may be short term (tactical) or longer term (strategic). The latter are largely interventions in seemingly intractable situations where the ingrained blockages are caused by a failure to deal with the boundary conditions of the systems in question. These situations manifest as conflict or persistent unintended consequences. Summarising Ulrich's (1983) perspective, Midgley and Pinzon (2011 p1545) state:

> *"….boundaries define the limits of the knowledge that is regarded as pertinent: they are not objective markers of systemic closure. In other words, no perspective is complete: all are partial, both in the sense of being limited and in that sense of being driven by value judgements. While we can always improve on our current understandings by widening the boundaries of analysis, we can never achieve comprehensiveness or perfect objectivity."* (Midgley & Pinzon, 2011, p1545)

2.3 The Possibilities from Integration

The comparative review of the overlaps between boundaries, systems and futures indicates a trend to recognise that there are common aspects as well as distinct aspects in systems thinking and futures thinking. This is not surprising in so far as both have a regard for underlying structure of the conditions they are dealing with and both are in some way developing contexts to support decision making. The question is, what value might there be in considering how the two fields might be more directly synthesised?

The survey of links between systems and futures, coupled with my own reflections on years of practice in the field of strategy development in corporations, public sector and third sector organisations, lead to three propositions that underpin the rest of this thesis. Some limitations that could be overcome are:

1. Systems thinking without scenarios thinking tends to be 'future blind' and deeply constrained by present evidence.

2. Scenario thinking without a systems context tends to be haphazard and deeply conditioned by entrenched beliefs.
3. We need a new framework to serve as a base for changing our understanding of systems and futures as being contiguous considerations of the same reality.

A synthesis could make a positive contribution to the way decisions about policy and strategy are supported. A synthesis could better frame the nature and methodology of decision making with systems-based and futures-based strategy work in business, governance and community resilience by creating emergent properties of insight which could not be achieved by the disciplines in isolation. Some of the key underpinning propositions to build this synthesis on are:

a) Essentially any depiction of a future situation configures that situation. This may be in relation to established categories, such as those used in scenario planning of STEEP (society, technology, economics, environment, politics) or PESTEV (politics, economics, society, technology, environment, values). These are *what it is like **then***.
b) Or the scenario may be in the form of a narrative in which there is an implicit configuration in the story line. These are *how we got from **now** to **then***.
c) Or the scenario may be a set of statistics of key parameters (economic growth, price of oil, proportion of consumer spending and so on). These are *how **'then'** is performing*.
d) Systems thinking can be an additional discipline to create plausible models of the various depictions to emphasise that *scenarios are dynamic narratives* that unfold, not simply static snapshots of a future.
e) 'Systemic' implies that there is, in some sense, a system that is behaving over time. This is modelled (always approximately) as a system structure and implicit dynamics that enable speculation about *behaviour over time*.
f) The very implication of behaviour over time implies *attention to a possible future state* indicated by the mental or computation simulation.
g) The very notion of intervention implies that there is an agent who is in some way interfering with the system in question. This may be benign (like a cure for an ailment) or disruptive (like downsizing an organisation).
h) Systemic intervention also implies a concern with, in some meaning of the word, *improvement* (Midgley, 2000). Improvement implies that at some point in the future a situation or system will be in a better state than it is at present. It is concept with a future embedded in it.

Reflection on Chapter 2

The investigation in this chapter was triggered by conversations and exchanges with Kees van der Heijden in 2010.[4] Discussing our independent experiments in incorporating systems thinking into scenario methods to strengthen structural understanding and the dynamic unfolding of narrative, it became clear that that this territory was only partly explored and certainly not integrated at a fundamental level. From those conversations emerged the idea of researching more deeply into the relationship between systems thinking and futures studies. My intuition at that time, based on decades of field practice as a consultant in both fields, was that this needed not simply a review of the literature but breaking new ground in how to think about this juxtaposition.

Van der Heijden makes the helpful distinction between the state domain and the time domain referred to earlier. However, in my view this does not go far enough. It seemed to me an entirely different way of framing, or rather meta-framing, of the questions was needed. This is illustrated in Figure 2.7.

The word 'domain' implies an area with a boundary. On the left of the diagram are the two domains of state and time depicted with an overlap, indicating a common area of usefulness in gaining insight and generating working material. However, the foundations of each domain are different. The state domain is the area of the systems sciences; the time domain is the area of scenarios and futures studies.

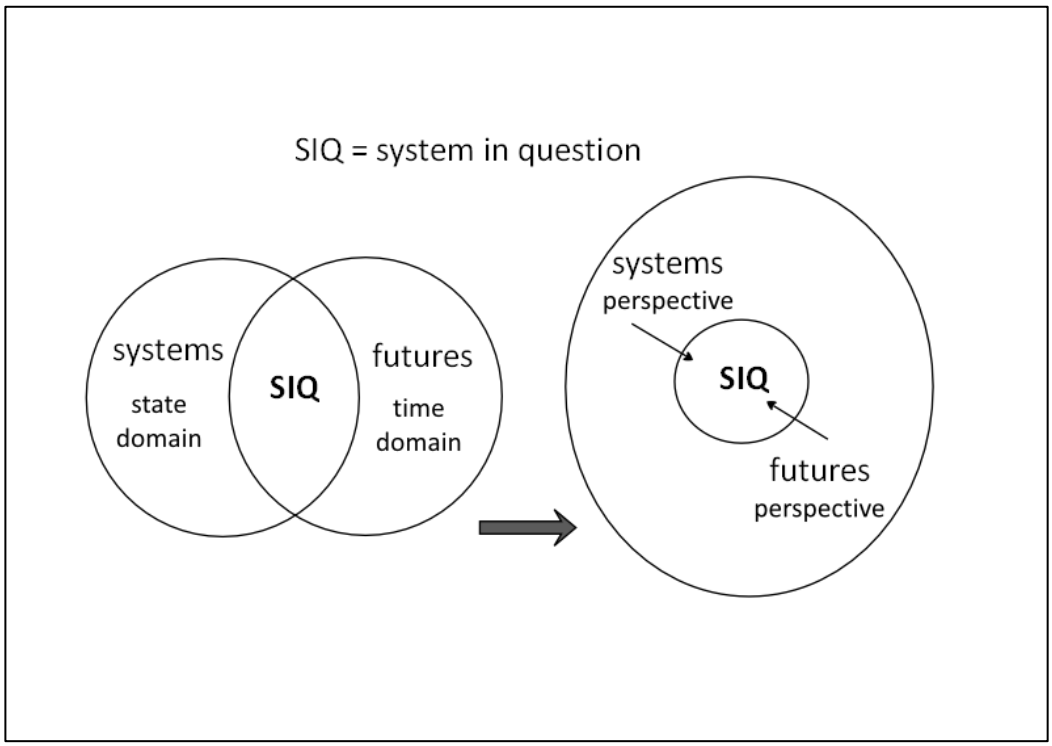


Figure 2.7. From domains to perspectives

4 Personal communications during and after the IFF Forum of April 2010.

Whereas the systems sciences have some reasonably well developed underpinning principles, Poli (2013) has pointed out that futures studies is rather lacking in this area. This makes it difficult to seek common ground and synthesis at more than a superficial level. On the right of the diagram, state and time are changed from domain to perspective. This assumes that there is some deeper 'reality' that is not subject to the categorical distinction of state and time which now appear as points of view on that common core. This takes the original distinction more into the orientation of radical constructivism, allowing a deconstruction of the key elements of systems and futures to be, so to say, put into the same basket for considering new constructs.

The radical constructivist perspective had something to contribute to the task of integrating futures thinking with systems thinking because it holds that science (including systems science) cannot transcend the domain of human experience. Established mental models are replaced by others that accommodate emergent anomaly and novel experience (von Glasersfeld, 2001). The creative aspect of identifying the 'not yet' is about mental models of the future rather than data which has , at best, only come to light as a 'hint'.

What this now enables is that the state perspective can be treated in a more general way as pattern. This can include models, rich pictures, emergent attractors and so forth. Also the time perspective can be treated in a way that questions the reduction of the time experience to simply a uni-dimensional phenomenon of simply 'one thing after another'. This can now include such ideas as latency, duration, thin and thick present moments and the possibility that 'time' has richer dimensionality. All these terms will be explained shortly.

With these considerations in view, Chapter 3 will prepare the ground for a synthesis.

Chapter 3: Synthesis through Complex Thinking

3.1 A Strategy for Synthesis

The proposed synthesis requires a strategy whereby systems thinking and futures thinking can be more closely brought together in a complimentary and mutually strengthening way. As the argument unfolds, the reader will find it helpful to cross reference the number in square brackets [n] of the point with the position of that number on Figure 3.1.

Three common systems ideas with a future orientation are that of simulation, adaptation and intervention. In the first case a mathematical structure, such as a system dynamics model, computes the multiple feedback implications of the system over a time period which could inform choices about the future. (See arrow labelled *simulation or improvement of* running from systems [2] to futures). In the second case an adaptive system has the capacity be alert to changing conditions and, through feedback, make adjustments to increase viability in the context of those changes. The capacity for this cybernetic adaptation also depends on the system itself having sufficient variety (that is possible states of the system) to have the needed adaptive repertoire. In the third case the values of a client indicate a desired future referred to as 'improvement'that is carried out by application of a systemic processes. (See the arrow running from [1] '*futures'* that influences the *configuration* of *'systems'* [2])

Two common futures ideas with a systems orientation are behaviours of socio-economic systems, where the future is based on growth or shrinkage in a 'system', and the idea of cycles.

My own recent work (Hodgson, 2013), in contrast, proposes an integrative basis for reframing of the relationship between the systems field and the futures field. This is the notion of the *ontology of the present moment* [3], further explained in Chapter 8. This can be regarded as a 'meta-framing' (Rossel, 2010), which incorporates some key ideas from the systems field:

> *"… meta-framing is a systematic, reflexive procedure applied to a reference-knowledge action, event or process. In Future Studies, this suggests that nothing is obviously imminent, accepted to be imminent or has its intrinsic properties; on the contrary the main idea is that there are always diverse levels of choice, contextual peculiarities and interpretative divergences involved"* (Rossel, 2010, p81).

Meta-framing is a way of unearthing hidden assumptions. For example, a powerful meta-framing concept and method is provided by boundary critique. (Midgley 2000) which challenges initial assumptions as to what is in and out of a system through reflection of the practitioner. Incorporating the notion of present moment [3] into systemic intervention requires the introduction of time and time-like dimensions, time boundaries as well as space and content boundaries. This is provisionally summarised as a holding concept in the central box as *present moment boundary critique* - expanding and enriching the present moment in individuals, groups and societies. [4] The potentialities of this approach will be illustrated by three examples in different settings. They

all have the characteristic of expanding and enriching the present moment consciousness of the practitioner.

To enable better understanding of present challenges and future implications of the world problematique (Ozbekhan, 1970), a *world system model* has been developed (Hodgson, 2011, 2012) and a version adapted for a collaborative learning game. Its application can range from an alternative to scenario planning for corporations to a way that communities can tune up to the current social challenges. [5]

Leadership development and coaching links strongly to the capacity of leaders to change mental models as the context changes, which is described as 'reperception' (Wack,1985). This can also be described as the capacity to mentally entertain a larger present moment [6].

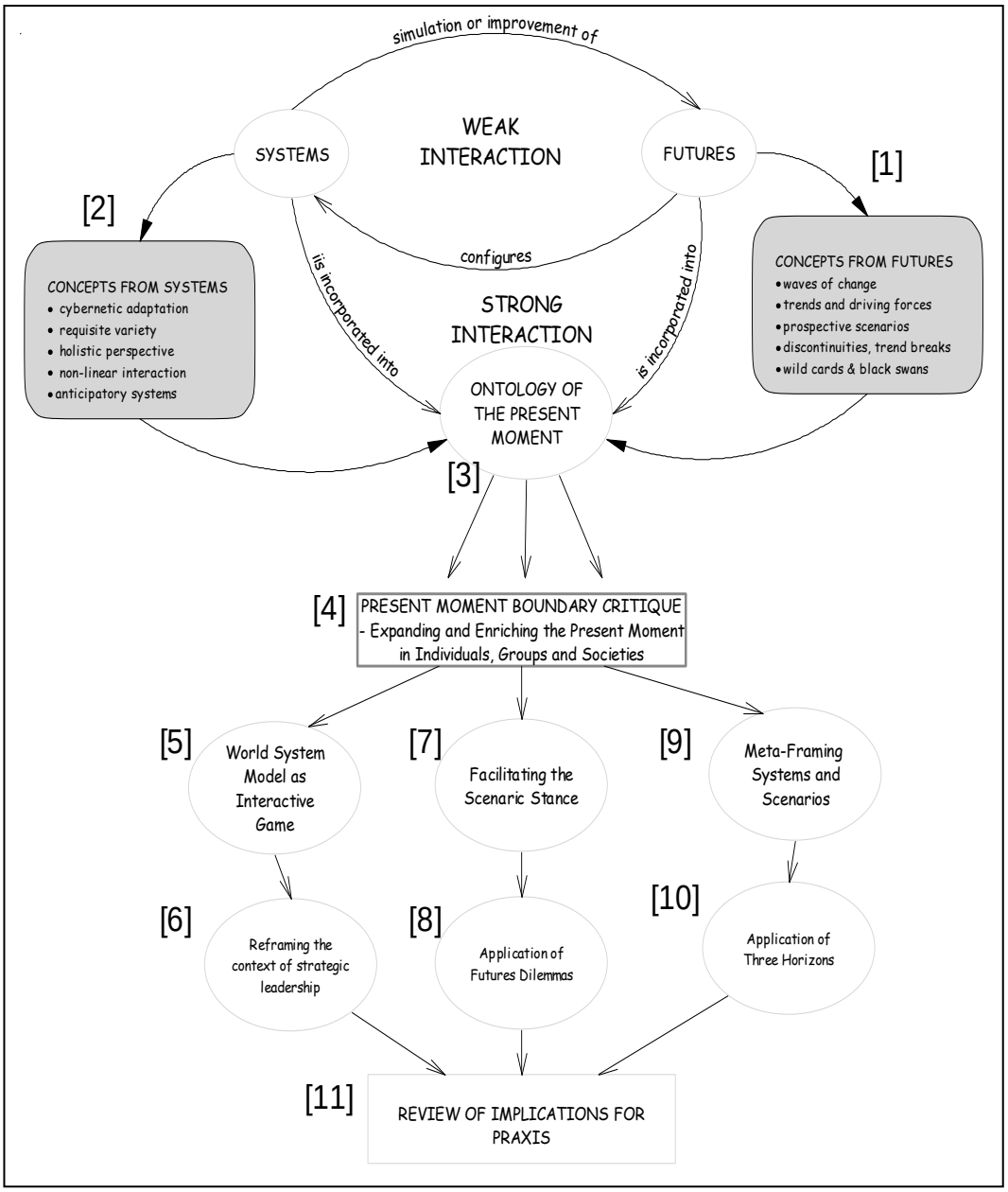


Figure 3.1 – A Conceptual Platform for Integrating Systems Thinking and Futures Thinking

A powerful contribution to expanding the present moment of futures thinking has been proposed by Ogilvy (2011) as the *scenaric stance*, in which the practitioner needs to hold apparently conflicting utopian and dystopian scenarios in mind [7].

Building on earlier work on futures thinking as the cognitive skill of holding dilemmas in mind (Hodgson, 2007), I will expand the development of the scenaric stance with the 'dilemma method' (Hampden-Turner, 1990). When you experience two mutually conflicting goals you are experiencing a dilemma. If this is not tackled consciously it can paralyse action, stifle creativity and diminish motivation and goodwill as the forces conflict with each other. Often the dilemma gets polarised into two warring schools of thought as two sides seek to convince each other of the value of their singular perspective. The dilemma method seeks to maximise the potential of both perspectives and then bring them together into a new, innovative solution. In this process it is essential to depart from *either/or* thinking towards a *both/and* creative resolution that integrates the best ideas [8].

Another potential of present moment theory is for it to serve as a meta-framing tool (Rossel, 2010) for understanding transformational change. This requires qualitative distinctions in the way we interpret future states beyond simply short, medium and long term. This also draws on the work of the International Futures Forum on transformational innovation in education (Leicester et al, 2013) [9].

Sharpe and Hodgson (2006) and Curry and Hodgson (2008) have developed a meta-framing of futures, the 'three horizons', which will provide a way of refining the kind of framing of the present moment that is likely to be effective in praxis [10].

The implications of these three ways of focussing the present moment boundary critique will be reviewed for their implications for both systems and futures praxis in the final chapters. (See [11])

3.2 Engaging With the World of Complexity

In Chapter 1 I made the case that juxtaposing and contrasting complicated and complex is not simply a matter of binary opposites. Rather, there is a progression of human thought which endeavours to keep pace with the unfolding realities of human life. Equally, this progression is not reducible to simple parallel tracks of the objective and the subjective. The emergence of quantum physics, second order cybernetics and a science of qualities may be an indication that the very nature of how we engage with our world has to shift paradigm to keep pace.

One characteristic of complexity is the diversity of components and the multiplicity of their interconnections. An important contribution to thinking about this came from Ashby (1956) in his concept of variety. Variety has a technical meaning, and is a measure of the complexity of the system. For example, one measure is the total number of distinguishable possible states of a system. Interestingly, the act of recognition of variety is second order since it depends on the observational

framing of the observer. Warfield (1999) has defined complexity in terms of observer dependence emphasising that observer-independent 'objective knowledge' is not actually possible.

From a cybernetic point of view, one of the key interests in variety is its role in the control of a system, namely the extent to which observation, action and feedback can guide the system. One of the criticisms of conventional organisational structure in functional hierarchies is that it is dominated by the viewpoint of the world of complications. This leads to extreme simplification of a control structure through vertical lines of control that have very weak horizontal coordination as in a conventional hierarchical organisation chart. Cross-functional communication is massively attenuated by the vertical structure. The left hand does not know what the right hand is doing. Ashby makes the point that the guidance subsystem needs to match in its variety the variety of the system or environment to be controlled, using the principle 'only variety can absorb variety'. Of course in an absolute sense this is impossible. However, absolute matching is not required for regulation; what is needed is *requisite* variety, which states that that the variety of the regulator must be large enough to reduce the range of outcomes of the system to the required level. Beer (1985 pp 21-35) shows how the meaning of the term 'requisite' is that there needs to be a balance between the capacity of the management to pay attention and the most crucial variables in the operational system. This is achieved by filtering out or *attenuating* those signals which are secondary and *amplifying* those signals which are critical for decision making. Regulating the proliferation of variety and designing prominence of crucial variety is seen to be the essence of viability.

Another way of viewing variety is to relate it to the number of variables in the system and its environment. Ashby (1956) points out that, from the cybernetic perspective, it is important not to treat variables as disconnected units. He defines essential variables as *"... Variables which are closely related to survival and which are closely linked dynamically so that marked changes in any one leads sooner or later to marked changes in the others."* Ashby, 1956, p42

A key aspect of regulation is decision-making, and this involves having some assumptive model of the way things work: 'if we do this then that will follow'. Conant and Ashby (1970) put this in a cybernetic context by stating that every good regulator of a system must function with a model of that system. If that model is implicit then it may be difficult to identify where it is deficient and mismatching with the real system. The development of an intentional model may improve performance if appropriate assumptions are made. But then there is an inherent limitation that complexity itself, beyond a certain point, is not subject to modelling. For example, by their very nature, it is difficult to model and anticipate the emergent properties of a complex system since any

model is a limited representation. There will always be stuff left out[5]. Also, a model, however well researched and thought out, is likely to be deficient in considering the future. That it is difficult to build foresight into models has been discussed in hierarchy theory (Allen, 1993),

To move further into complex thinking we need some clarifying principles to distinguish between complicated and complex. Poli (2013) sums up what he calls the golden rule for making the distinction:

> *"Complicated problems originate from causes that can be individually distinguished; they can be addressed piece by piece; for each input to the system there is a proportionate output; the relevant systems can be controlled and the problems they present admit permanent solutions. On the other hand, complex problems and systems result from networks of multiple interacting causes that cannot be individually distinguished; must be addressed as entire systems, that is they cannot be addressed in a piecemeal way; they are such that small inputs may result in disproportionate effects; the problems they present cannot be solved once and forever, but require to be systematically managed and typically any intervention merges into new problems as a result of the interventions dealing with them; and the relevant systems cannot be controlled – the best one can do is to influence them, …"* (Poli, 2013, p142).

So the Connant-Ashby theorem that the regulator of a system must contain a model of the system regulated, reaches a limit of applicability in complex systems exhibiting creativity because this can introduces factors that are inherently unpredictable by any model. The latter will always be incomplete and divergent from reality over time. Complex systems exhibit creativity in the form of capacity to change, learn, and over time exhibit quite different pattern. This was simply demonstrated by Ashby with his 'Ashby Box' as reported by von Foerster (2016, p24).

Poli (2013) also makes the important point that a key attribute of complex systems is that they are creative:

> *"The main reason why complex systems have these apparently strange features is that they are creative. Being creative includes the capacity to change, learn, and over time become different from what one was before. To mention but one component of creativity, the capacity to (either implicitly or explicitly) reframe is one of the defining features of creativity. Creativity also includes some capacity to see values and disvalues, and to accept and reject them. Therefore, it is also the source of hope and despair. None of these properties are possessed by complicated systems."* (Poli, 2013, p145).

In a science dominated by models, calculations and measurements, how do we break free into a form of complex thought that has a better correspondence with the messy situations that present themselves? Morin (2008) sums up the challenge eloquently:

> *"What is complexity? At first glance, complexity is the fabric (complexus: that which is woven together) of heterogeneous constituents that are inseparably associated: complexity poses the paradox of the one and the many. Next, complexity is in fact the fabric of events,*

[5] "I can only refer to Socrates, who said 'I know that I don't know.' But many don't even know that. He knows that he knows nothing; that is an initial condition of knowledge; but many do not know that, and that is a condition of second-order ignorance." Von Foerster, 2014, p26

> *actions, interactions, retroactions, determinations, and chance that constitute our phenomenal world. Such complexity presents itself with the disturbing traits of a mess, of the inextricable, of disorder, of ambiguity, of uncertainty. Hence the necessity for knowledge to put phenomena in order by repressing disorder, by pushing aside the uncertain. In other words, to select the elements of order and certainty, and to eliminate ambiguity, to clarify, distinguish, and hierarchize. But such operations, necessary for intelligibility, risked leading us to blindness if they eliminate other characteristics of the complexus. And in fact, as I have argued, they have made us blind"* (Morin, 2008, p5).

Where the characteristics we are dealing with are uncertainty and ambiguity, we are more in the domain of foresight and futures thinking. The question is, through a form of complex thought, can we integrate systems thinking and futures thinking into a common meta-framework that will enrich and improve the way that decision thinking can be undertaken?

At this juncture it is important to further clarify the way that Morin (2008) considers complexity. I have deliberately introduced his perspective as distinct from the form of complexity science that has developed principally in the USA, initially focused on the Santa Fe Institute. Morin strongly critiqued the foundations of scientific and philosophical inquiry, pointing out the limitations of the Cartesian paradigm of simplicity. Montuori (2013) sums up Morin's position in relation to the systems sciences thus:

> *"Morin saw the enormous potential of these new approaches while recognising their limitations and misuses, refusing to be limited by ideological boundaries. In the process he developed his own complex interpretation of systems theory, information theory, and cybernetics designed to connect the various dimensions of human enquiry, separated as they were in their own world and disciplines, refusing to communicate with each other. Method begins with an extensive discussion of the relationship between order and disorder, the key role of emergence, unpredictability, and uncertainty in his approach to complexity, and the importance of the prefix re- , as in reorganisation, rethinking, and so on, suggesting ongoing process and change."* (Montuori, 2013, p11).
>
> .

It is essential to reframe the way that most practitioners think about either systems thinking or futures thinking sufficiently to create room to manoeuvre. Morin gives us a lead in how to proceed, trying on the profound concepts of the separate fields of systems, complexity and foresight without having to be overly constrained by their self-referential criteria. This is all about transdisciplinarity.

Nicoloescu (2007, p143) distinguishes between

1. Multidisciplinarity
    - Studying a topic in several disciplines at the same time, thereby enriching understanding by incorporating their differing perspectives.
2. Interdisciplinarity
    - Transferring methods and thinking from one discipline to another which can lead to the development of new disciplines.
3. Transdisciplinarity

- Concerns itself with what is *between*, what is *across* and what is *beyond* clusters of disciplines – engaged in understanding the present world from the perspective of the imperative of the unity of knowledge.

A useful summary of the transdisciplinary attitude is provided by Montuori (2008, p xxvii):

1. *"A focus that is inquiry-driven rather than discipline driven. This in no way involves a rejection of disciplinary knowledge, but the development of knowledge that is pertinent to the enquiry for the purposes of action in the world.*
2. *A stress on the construction of knowledge through an appreciation of the meta-paradigmatic dimension - in other words, the underlying assumptions that form the paradigm through which disciplines and perspectives construct knowledge. Disciplinary knowledge generally does not question its paradigmatic assumptions.*
3. *An understanding of the organisation of knowledge, isomorphic at the cognitive and the institutional level, the history of reduction and disjunction (what Morin calls "simple thought"), and the importance of contextualisation and connection (or "complex thought").*
4. *The integration of the knower in the process of enquiry, which means that rather than attempting to eliminate the knower, the effort becomes one of acknowledging and making transparent the knower's assumptions and the process through which he or she constructs knowledge."* (Montuori,2008, p xxvii).

These four guiding principles underlie the way this work is structured.

3.3 Complex Thinking about Time and System

In his work on strategy, Normann (2001, p69) introduces the term *upframing*. This is a variant of reframing that emphasises that to gain a new perspective on any field or issue it is necessary to 'step above' the usual frame of reference to something more over-arching and inclusive. It has many parallels to Rossel's (2010) metaframing introduced on page 81. The essence of the idea is:

> *"In principle we can move upwards into higher levels of aggregation – 'upframing' – or we can move downwards and focus on more specific phenomena. Upframing allows us to see more structure and pattern, downframing to see more detail. As we upframe from the detail, the detail becomes part of a larger Gestalt; its positional value as opposed to its intrinsic value will stand."* (Normann, 2001, p193).

The main upframing idea put forward here is regarding the nature of space and time in the context of awareness. This apparent abstraction has very concrete implications. Any physical system seen basically as an assembly of components has a configuration of those components in space. It is equally true that any systemic model, for example a computer simulation, has a configuration in a virtual space. Further, any physical system endures in time and exhibits a pattern of behaviour over

time. Whether the interest in time is based on an improvement in the future or an anticipation of future behaviour, the notion of time is embedded.

The conventional way to frame these considerations is to place them in a three dimensional space behaving along a linear dimension of time. My upframing questions are:

- What if the conventional assumption of space-time is a reductive abstraction of a much more complex context, within which 'reality' is it taking place?
- What if the linear convention of time (basically 'clock' time) is just one aspect of a much more complex phenomenon?
- What if space is not simply a passive container but has latent aspects which are structural and informative (in the sense of in-forming)?
- What if that the state of the observer is a factor in the configuration of space and time that is more than a detached abstraction?
- What if in some sense the 'yet to be' is intrinsically present in the now?

If the answer to these questions is affirmative, then a quite different way of interpreting and thinking about system, structure, behaviour and anticipation becomes possible. Exploring this possibility is the task of 'time, pattern and perception'. It is an exercise in complex thought and transdisciplinarity.

Two main generic ideas anchor this exploration. Each comes from mentors, namely J.G. Bennet and David Bohm, I was privileged to work with as a young Research Fellow. The ideas excited me greatly in my twenties but now, fifty years later, I see much greater implications of taking them seriously and in combination. From the integration of these ideas it is natural to reach out into several different disciplines and, whilst appreciating their contribution, place them is this large upframed context and give them a more integral significance.

The notion of the present moment (introduced by Bennett and elaborated by me in Chapter 8) reframes our understanding of both the nature of the future and the nature of system. The concept of the present moment changes the way we think about time from just linear cause-and-effect to a property of existence which is richer in dimensionality. It does this through scrutinising our experience, as far as possible without the conventions of space, time and future that have developed in the Cartesian era. The present moment is also grounded in the experience of a self: yourself; myself; experiencing societal selves.

> *"We live in the present moment. So far as we can have any direct perception and sure knowledge, this present moment is all that there is. Because its content changes, we tend to think of it as impermanent, a state of perpetual perishing as Locke expressed it. But it is also a state of perpetual renewal and neither the perishing nor renewal are so certain as the immediate experience of the present is always here and now."* (Bennett, 1966, p13).

The second generic idea is the 'implicate order', and this was introduced to me by David Bohm in the context of dialogues with him over the same time period. The notion of the implicate

order is a metaframing used to break out of some of the constraints of quantum physics and explore other possibilities than the Copenhagen school (Faye, 2010, 2014). The universe is considered to be a qualitative infinity which is inherently unknowable in its totality. The observable universe exhibits a pattern, the explicate order, which is unfolded from the underlying implicate order. This unfolding is most directly observed as a process in time which the mind of the observer fragments but is actually an unbroken whole which Bohm (1980) called the 'holomovement':

> *"In the enfolded [or implicate] order, space and time are no longer the dominant factors determining the relationships of dependence or independence of different elements. Rather, an entirely different sort of basic connection of elements is possible, from which our ordinary notions of space and time, along with those of separately existent material particles, are abstracted as forms derived from the deeper order. These ordinary notions in fact appear in what is called the "explicate" or "unfolded" order, which is a special and distinguished form contained within the general totality of all the implicate orders."* (Bohm, 1980, p xvii).

In both ideas there is the common characteristic of a 'second order perspective'. In both cases the observer is participating. The experience of the present moment is grounded in a sentient self. The unfolding of the implicate order is in the context of the quantum inseparability of the observer, the observed and the observation.

The view I adopt here is well formulated by Morin in the following two extracts:

> *"Through this systemic route, the observer – excluded from classical science – and the subject – excoriated and rejected as so much metaphysical trash – make their re-entry into the very heart of physis. This brings us to a key idea: there is no longer a physis isolated from humanity, which can be isolated from its understanding, its logic, its culture, and its society. There are no objects independent of a subject." .....*
>
> *"The systemic relation between the observer and observation can be conceived in a complex manner whereby the mind of the observer/conceptualizer, his or her theory, and more widely, his or her culture and society, are considered as so many ecosystemic envelopes of the physical system being studied."* (Morin, 2008, p108).

Reflections on Chapter 3

What began for me as simply looking for common ground between the elements of systems thinking and futures thinking morphed into a search for higher level concepts that would provide some principles for what shape that reorganisation might take. In my strategy work I had been influenced for many years by Normann's (2001)notions of upframing as a way to shift business competition into totally new arenas. Could what worked in strategy also work in this area of desired synthesis?

Rossel (2010) introduced me to the fact that, in academia, an equivalent notion is meta-framing. In facilitating creative problem solving I was practiced in the use of re-framing and what intrigued me about Normann's idea is that it goes beyond this. Meta-framing also goes beyond reframing since it requires a more penetrating questioning of assumptions and comparison across a wider field of knowledge. I found this to be congruent with the discipline of boundary critique (Midgley, 2000), where assumptions are to be questioned.

It seemed clear that generative thinking was necessary, but this required a perspective different from the usual ones.

One of the things I have learned in my study of the history of scientific breakthroughs, and also strategic innovation in businesses, is that new ideas come out of "left field". I regard Bohm's notions of the implicate order and holomovement are of this type, evidenced by the way, until recently, his work was largely marginalised in the discipline of Physics, but is now coming back into consideration.

Quite independently from this work (initially) I submitted a piece of writing on a meta-framing of time and the future as part of an exploration of developing a stronger theoretical base for future studies (Hodgson 2013). As I was completing this, it occurred to me that the idea of the present moment could be the clue to a meta-framing perspective for the synthesis of systems and futures.

Figure 3.1 is based on an early sketch made in the first weeks of my PhD journey, which then evolved but which still holds the frame of my thesis. The first stages (upper part of the diagram) are more about the deconstruction of what is, whereas the middle is about the meta-framing with the present moment concept. The lower part of the diagram is an exploration of what difference this makes to our reading and interpretation of some methods.

Meta-framing, to me, is about adopting a reflexive stance where self-observation and participative second-order considerations are essential. Complex thinking and reflexive thinking need to be brought to bear. Part Two moves into the territory of reflexivity.

****

PART TWO – Thinking Reflexively

Chapter 4: Thinking Reflexively about Systems

4.1 The Nature of Reflexivity in Systems

I am proposing reflexivity as one of the key notions required to shift the framing of the nature of systems and the nature of futures towards an integrated view. Reflexivity implies that the presence of the observer is fundamental in our understanding of any situation. It also implies that the observer is not detached, as in the view of mainstream science or first order cybernetics. The observer participates and affects the reality under consideration. We can consider the implications of this from two viewpoints; one from the perspective of the single human observer, and the other from the point of view of social systems.

An example in social systems is the notion of reflexivity as developed by Soros (2006), who uses this to frame the way he speculated successfully in financial markets. In his own words:

> *"On the one hand, we seek to understand our situation: I call this the cognitive function. On the other hand, we seek to make an impact on the world: I call this the participating function. The two functions work in opposite directions, and they can interfere with each other. The cognitive function seeks to improve our understanding. The participating function seeks to make an impact on the world. If the two functions operated independently of each other, they could in theory serve their purposes perfectly well. If reality were independently given, our views could correspond to reality. And if our decisions were based on knowledge, the outcomes would correspond to our expectations. But that is not what happens because the two functions intersect: and where they intersect, they can interfere with each other. I have given the interference a name: reflexivity."* (Soros, 2006, p 6)

This notion of the participating function he extended to interpretation of the Stock Market as a social-financial system and further to his setting up of his foundation for developing open societies.

Umpleby (2007) considers the theory of Soros to be quite congruent with second order cybernetics. He points out that reflexivity occurs in social systems when an actor observes and thinks about his or her actions and their consequences and then, on the basis of this, modifies his or her behaviour which in turn influences the consequences. An example is when an investor makes a trade that itself alters the price in a way that changes the condition of the trading arena.

Conventional economics is based on equilibria in which, for example, increases in stock price will suppress demand towards stability. But in speculative investment, and a rise in prices can function an *indication* to buy thus further increasing demand. This can become the dynamic of a bubble that eventually will burst.

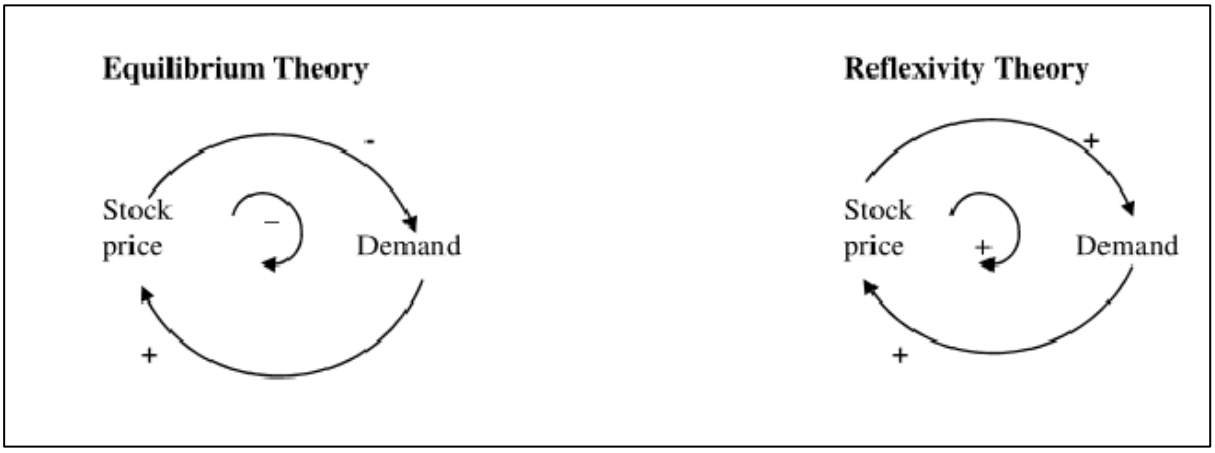


Figure 4.1 Negative and positive feedback (Umpleby, 2007, p10).

This can drive market conditions far from equilibrium until a crash occurs or a bubble bursts through multiple participants using socially shared interpretations. Umpleby uses basic causal loops to illustrate the different dynamics between the two theories, as shown in Figure 4.1.

The same principles of cognition and participation apply at the individual level. We can illustrate this by a further series of diagrams. In the end, in the first diagram, the Observer is represented as distinct and detach from the system under observation. This is a first-order interpretation.

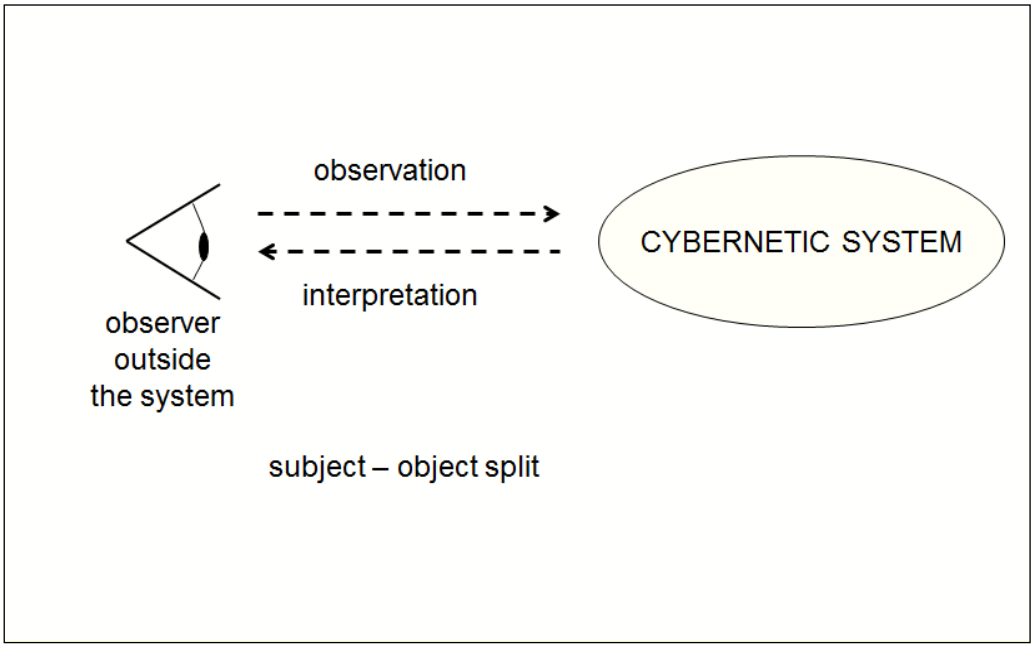


Figure 4.2 - 1st order observation

If we now include the Observer inside the system, as part of the system, then we have a second order interpretation.

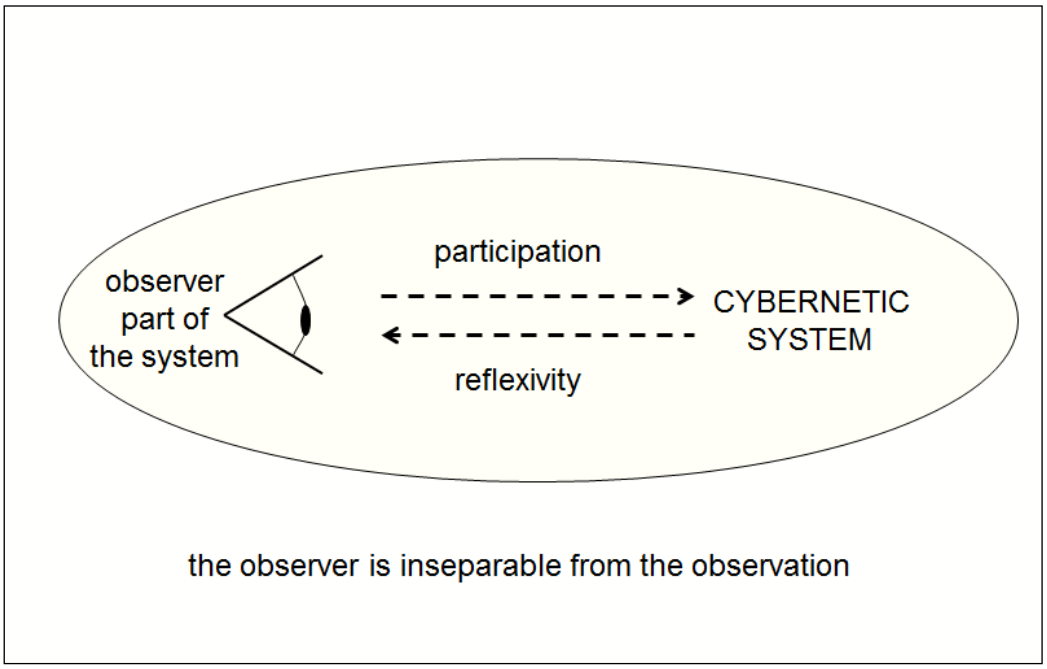


Figure 4.3 - 2nd order observation (weak)

However, I'm calling this 'weak second order' because participation in the system does not necessarily mean the capacity to observe the total system. For a strong second order paradigm, it is necessary for observation of the observing; in other words the capacity to self-reference and self-critique.

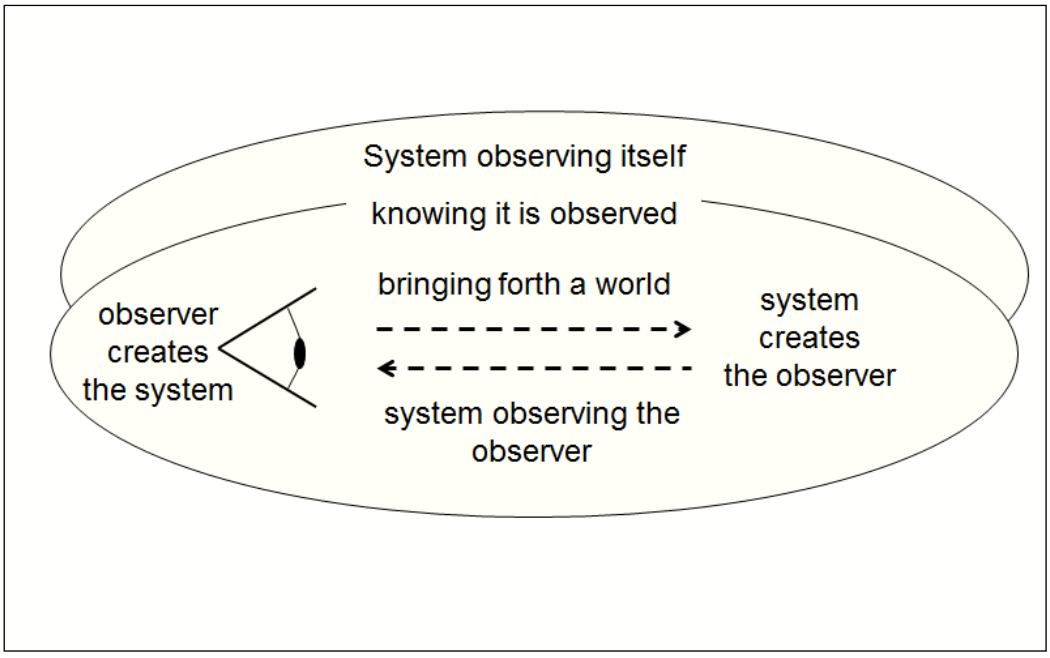


Figure 4.4 - 2nd order observation with reflexivity (strong)

In the strong second order paradigm there is the additional property that the power of the observation is itself bringing forth the world of the system. I mean this in the sense where the fact of observing changes the trajectory of the system rather than in the sense of Maturana and Varela (1987), that the only 'world of the system' we can know is our internal model of the system.

This lands us in the area of enactive cognition.

Bishop and Nasuto (2005) have considered the implications of a combination of second order cybernetics, the enactive theory of perception and dynamic systems. The enactive theory of perception differs from the internal representation of reality view of perception and cognition (Holland et al, 1986). It depends on three fundamental considerations: firstly, low-level biological processes; secondly, high-level phenomenological experiences; and thirdly, some kind of bridging dynamical theory between these two domains.

"Conscious experience occurs only at the level of the whole embodied and situated agent" (Varela et al., 1991). In other words we do not 'have' experience; we 'do' experience. According to this view, conscious experience requires an interactional coupling between three factors or dimensions.

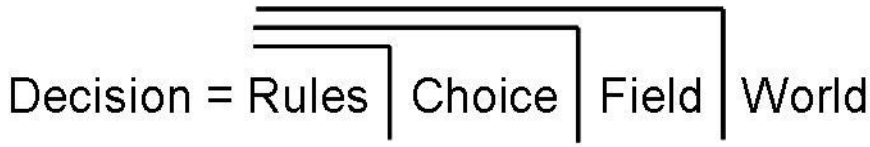
> *"These dimensions are intersubjective interactions in social behaviour; organismic regulation related to the operation of the autonomic nervous system, linking the fundamental physiological processes of the body to primal consciousness, or sentience – feeling of self; and finally, the sensorimotor coupling between an agent and the environment."* (Varela et al, 1991, p1313).

At this stage of the discussion we begin to come up against the limitations of language, especially the linear language of subject-verb-object. In systems thinking this limitation is generally overcome by the use of loop diagrams which, for example through arrows connecting variables, are able to state that an effect is influencing its cause as well being caused. There is, however, another discipline that can express these ideas in a more general form.

Spencer-Brown (1972) developed a mathematical language he called the 'laws of form', based on the notions of distinction and self-reference. Distinction is represented by the first mark

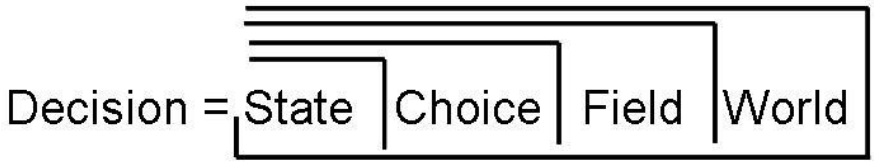
The mark splits a domain, say the decision field, into an inside and an outside. Self-reference is represented by the second mark, which loops back on itself implying the basic second order relationship of "A implies A". This type of structure is basic to biological systems, which have the capacity of self-forming or autopoiesis. This is also referred to as a *re-entrant system*.

In second order systems we can also treat the observer as an enactive decision maker who makes choices that reflexively affect the system and him or herself. In form language this can be represented as:



Spelled out in English, this reads "*decision* is a function of a set of *rules* which determine a *choice* within the decision *field* in the context of the *world*." This is topologically a nested structure.

The structure of reflexive action can now be represented in this symbolism, showing the structural distinction.



This reads "*decision* is a function of the *state* of the decision maker which determines a *choice* in the context of a decision *field* which is in the *world* which itself includes the *state* of the decision maker." This is also expressed in the never-ending sentence: "The world context of the decision affects the state of the decision maker which determines a choice which is embedded in the decision field which is itself embedded in the world which affects….." In commenting on the general mathematical form of this nested and re-entrant relationship, Kauffman (2015) points out that in essence

> *"… the reentering mark would represent autonomy or autopoiesis. It represents the concept of a system whose structure is maintained through the self-production of its own structure. This idea of a calculus for self-reference, and the production of a symbol for the fundamental concept of feedback at the level of second order cybernetics captured the imaginations of many people, and it still does! Here is the ancient mythological symbol of the worm uroboros embedded in a mathematical, non-numerical calculus."* (Kauffman, 2015, pp. 12-13).

We are building the case that observer and observed, decision and action, intervener and intervention are deeply inseparable. Where they are separated, we have made a reductive simplification from the complex world to the complicated world. This suffices, and indeed is very effective for some situations and purposes, but leads us into a world of unintended consequences and emergent disruptions if applied exclusively. This applies at every level from the individual, through

human societies to the whole planetary socio-ecological super-system. It was pointed out to me[6] that from the perspective of the photon there is no separation between my eye and the star I am looking at. It is somewhat of a leap to suppose by looking at them we could influence the stars but the photonic connection may well be there!

Morin (2008) makes an impassioned argument that, for complex thought suitable for engaging with the world of complexity, we need to give this reflexive stance primacy:

> *"And so the world is interior to our mind, which is inside the world. Subject and object in this process are constitutive of each other. This doesn't lead to a unifying and harmonious vision; we can't escape from a generalised principle of uncertainty. In the same way that is in micro-physics, the observer disturbs the object, which disturbs the perception, in the same way the notions of object and subject are profoundly disturbed each by the other: each opens a crack in the other. There is, as we will see, a fundamental, ontological, uncertainty in the relation between the subject and the environment, that only the absolute (false) ontological decision can settle concerning the reality of the object or of the subject. A new conception emerges both from the complex relation between the subject and the object, and the insufficient and incomplete character of the two notions. The subject must remain open, deprived of all decidability in itself; the object itself must remain open towards the subject and toward its environment, which, in turn, necessarily opens and continues to open beyond the limits of our understanding."* (Morin, 2008, p26).

I extract from this review the following guiding principles that need to underlie the efforts to reframe thinking about systems and futures:

- The integrity of subject and object, observer and observed are primary. Their reductive separation is secondary
- Reflexive interference between these two aspects gives rise to unavoidable uncertainty
- That whatever reality is, it is fundamentally open beyond the limits of our understanding

We can now begin applying this fundamental notion of reflexivity to ways of reframing both systems thinking and futures thinking in a way that may progress towards a more integrated view.

4.2 Reframing the Notion of System

Do systems really exist? In the field of systems thinking we find a range of views on this question from systems existing in their own right (Laszlo, 2014), with their own autonomous properties, to systems being constructed in our mind that can be pragmatically useful but have no corresponding reality (von Glasersfeld, 2001). On this question I wish to stick to the middle ground between these two polarised views.

[6] J.G.Bennett – personal communication, 1963

A useful example of system autonomy is that of the living cell. In the days before electron microscopes, the cell was considered as something like a blob of jelly with no specific boundary structure. With the advent of high resolution microscopy it was discovered that cells did in fact have a membrane of phospholipids, which formed a sealed boundary containing the active material of the cell. The sealed boundary was itself punctured with thousands of protein molecules which enabled input (perception) and output (activity) modulating the relationship between the cell and its environment. It was also discovered that the complexity of the cell membrane far outweighs the complexity of the DNA in the nucleus of the cell, and this led to the field of epigenetics.

Saeed et al (2014) shows that, for example, our immune system is much more strongly regulated by the environment than was previously supposed. Distinct epigenetic programs carry out, that is implement, immune tolerance and develop trained immunity. A crucial factor in this process is the cell membrane and the way embedded proteins regulate incoming and outgoing molecules. The variety of the cell membrane is much greater than the variety of the DNA.

What is interesting for our purposes in this development is that the living cell combines both its own intrinsic capacity to keep itself alive with an absolutely essential openness to its environment. It is this reciprocal relationship that describes the cell as a system. Treat the cell as a closed structure and it is a dead cell; treat the cell as a mere conjecture and then life, organism and inheritance are not understood.

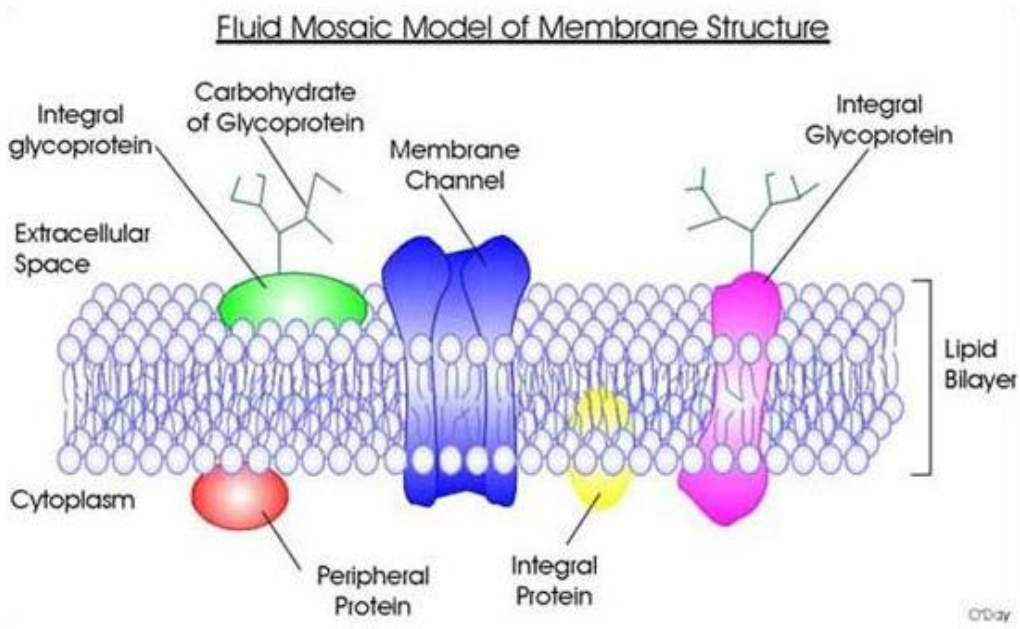


Figure 4.5 The cell is enclosed in a membrane defining its boundary. The penetration of the membrane by proteins renders the membrane open for two-way exchange with its environment. (Drawing courtesy Danton H. O'Day, 2012, http://www.utm.utoronto.ca/~w3cellan/cell_membrane.html).

So far this description of the living cell has been in the form of detached observation. Staying true to our reflective principles, what then are the second order implications? The field of epigenetic and related studies has raised the question, not only of the impact of the environment on life, but also the implications of the mode of perception of the living being. This of, course, is particularly relevant to human health and well-being where it is being shown that the conditions of stress can close down the openness of the living organism and cut it off from the essential, healthy interdependence it needs to have with its environment. In other words, perception becomes a component of the 'livingness' of the cellular structure. This, of course, is particularly the case of the self-aware human organism.

In the human being we need to take perception further into the realm of appreciation. Vickers (1965) affirmed that 'human systems are different.' As a policy maker, Vickers placed great emphasis on the role of human judgement, which he regarded as a flexible and reflexive capacity. This is reflected in his notion of the *appreciative system*. Attaching the word 'appreciative' to 'system' is a second order perspective in which the human being is part of the system and is reciprocally adjusting his or her views, interpretations and judgements to the changing conditions.

> *"Such judgements disclose what can best be described as a set of readinesses to distinguish some aspects of the situation rather than others and to classify and value these in this way rather than in that. I will describe these readinesses as an appreciative system. I call them a system because they seem to be organised as a whole in ways to which I will return, being so interrelated that a change in one part of the system is likely to affect and be dependent on changes elsewhere. I will describe the current state of such a system as its setting, as we speak of the setting of a man-made regulator, to describe the governing relations to which it is for the time being set to respond (though with the mental reservation that in human systems this setting is to some degree self-set); and I will describe the settings of several such systems as an appreciative field, when I'm concerned with the way in which they interact with each other."* (Vickers, 1965, P67)

The appreciative field is essentially a property of an individual policymaker involved in judgement calls regarding the system of interest. A further stage of reflexivity is to consider whether societies, as distinct from individuals, can also in some way be involved in an appreciative field. According to Luhmann (1990) societies can and do behave in a second order reflexive way, although this is somewhat different from the conscious intervention of an individual human being. His key question is the effect of the society observing itself and further observing the observation. He begins from the idea of autopoiesis operating in a society so that a society's institutions are self-making. He does not regard this property of society to perpetuate itself as a cognitive function, but rather a communicative one, as he challengingly argues that institutions are made up solely of communications (the individuals producing the communications being in the environment of the system). According to Luhmann, institutions are autopoietic because they assess the relevance of new communications with reference to a core binary opposition (e.g., scientific versus non-scientific for the Science System; and legal versus illegal for the Legal System) and precedent in the system . Anything that does not resonate with the core binary opposition cannot be 'heard', and thus the

institution ensures that all communications that make it up are of the same basic type. Luhmann (1990) explains further:

> *"First, there is autopoietic autonomy which is based on operational closure and means that the system can only reproduce its own structures and operations with its own operations, that is, from its own products. This is to be distinguished from cognitive closure, and, correspondingly, cognitive autonomy. This says that along with all its cognitions the system is also observing that these are only its own observations. Only having reached this point do we find ourselves on the terrain in which second-order cybernetics in the strictest sense is interested. Here, the question 'who is the observer?' is asked universally and is also applied to the observing system. Questions about the observer take the place of questions about reasons, which would necessarily result in an infinite regress. And therefore, whoever wishes to give reasons for his own experience or actions must observe himself as an observer and, in doing so, allow access to the choice of the distinctions which guide his observing"* (Luhmann, 1990, p118)

The implications in the last sentence of observing himself as an observer and being aware of the choice of distinctions that shape observations takes us well out of the first order way of regarding societies and behaviour.

Von Foerster (1995) also considers the role of judgement in relation to who is making a judgement in relation to ethics and decision making. Without the self-observation of the decision maker, we are reduced to a mechanical causality occurring in the flow of mechanical time, expressed by him as similar to the behaviour of a copying machine: *"With the essence of observing, namely the processes of cognition, being removed, the observer is reduced to a copying machine, and the notion of responsibility has been successfully juggled away."* (von Foerster, 1995, p7).

The important point here is to recognise that a self is making a judgement about the system in question and its boundaries, and on the methodology which is being used to describe, map and model the system. Assuming that a value position is inseparable from a self giving rise to it, it is necessary to extend boundary critique from analysis of the problem situation to analysis of the positioning of the self that gives rise to the analysis of the problem situation (Midgley, 2000; Midgley and Ochoa-Arias, 2004; Midgley et al, 2007; Midgley, 2011).

These considerations are also consistent with a reflexive view of systems where the observer should not be excluded from the observation. Integrity on decision making within a human appreciative system is a reflexive act. I have elaborated this view as the concept of decision integrity (Hodgson 2010):

> *"This leads to a questioning of the dominant worldview and the suggestion that reflexive theories may offer better prospects. This entails a shift from first-order cybernetics to second order cybernetics. Decision integrity is postulated as an approach that integrates a systems approach in the second order context and includes the ethics of the decision maker as a scientific component. This offers the prospect of changing the way difficult or undecidable questions are tackled"* (Hodgson, 2010, p70).

So where does this point in terms of reframing the nature of systems attended to?

a) Systems are embedded and enactive as well as observed and represented
b) The various system languages, disciplines and codifications are abstractions of that embeddedness and will suffer from limitations as well as the strengths of what they bring out about the situation of interest
c) The systems thinker as a human being is consciously or unconsciously always imposing a limited convention on the situation of interest, even when using a systems theory, although systems theories are more likely to be able to represent reflexivity than many others
d) Systemic cognition is taking place within a reflexive appreciative system
e) There are many more aspects and dimensions present in any selected by a given systemic intervention than are attended to by a such an approach
f) Systemic intervention may be closed and determined or open and uncertain
g) Systems practice needs the meta-perspective of complex thought

4.3 System as a Special Case of Pattern

Point (e) above may seem obvious, but the implications are considerable. The implication of 'many more aspects' is that any systems perspective, as we conceive it, is a limited interpretation of what we are looking at. The constructivist position implies that there is no final 'objective' reading of any situation since that reading depends on the state of the intervenor. If we are to reframe, or rather upframe, our view of systems, we need some way of codifying a higher level of perspective or recursion. The key concept selected for doing this is that of *pattern* and *patterning*. We will look at this from two perspectives: one abstract and mathematical, and the other concrete and related to design.

In recent years the historic boundaries of mathematics, such as arithmetic geometry, have considerably expanded with such topics as group theory, statistics and control theory, to name but a few. As an applied language it has now expanded beyond disciplines like physics and engineering and is critical in areas like manufacturing, logistics, medicine and social science. It has been fundamental for some years to operational research. Enhanced by software and computer its abstract structures have been rendered visible and are recognised increasingly as pattern. Steen (2010) sums up the position as follows:

> *"Mathematics is the science of patterns. The mathematician seeks patterns in number, in space, in science, in computers, and in imagination. Mathematical theories explain the relations among patterns; functions and maps, operators and morphisms bind one type of pattern to another to yield lasting mathematical structures. Applications of mathematics use these patterns to 'explain' and predict natural phenomena that fit the patterns. Patterns suggest other patterns, often yielding patterns of patterns. In this way mathematics follows its own logic, beginning with patterns from science and completing the portrait by adding more patterns that derive from the initial ones."* (Steen, 2010, p616).

A recent striking example of this view comes from the Nobel Prize winner, Wilczek (2015) who has made a special study of how the notion of beauty and symmetry have been highly significant in the recognition of fundamental laws of physics at every level from the dynamic to the quantum to the cosmological.

This is relevant to the field of systems in that much of the language and codification of systems thinking is mathematical and geometric, whether it is differential functions of relationships or causal loop diagrams. It is interesting that Steen mentions imagination. In what are often referred to as the 'softer' methods of systems thinking, techniques such as rich pictures and gigamaps are used.

The role of beauty in the discovery of fundamental mathematical physics lends weight to this argument. Nobel Prize winner, Wilczek (2015) expresses the point this way:

> *"…we find interesting phenomena (phenomena we can learn from!) in physics beautiful. An important consequence is that we especially value experience that is surprising, but not too surprising. Routine, superficial recognition will not challenge us, and may not be rewarded as active learning. On the other hand, patterns whose meaning we cannot make sense of will not offer a rewarding experience either; they are noise. ….From the appearance of part of a symmetric object we can predict (successfully!) the appearance of the rest; from the behaviour of parts of natural objects we can predict (sometimes successfully!) the behaviour of wholes. Symmetry and economy of means, therefore, are exactly the sorts of things we are apt to experience as beautiful."* (Wilczek, 2015, p14-15)

When we turn to design we find that, arising in architecture (whether of physical buildings or software), the depiction and application of forms of pattern becomes a crucial tool for practical understanding. A pattern is a morphological law that expresses a relationship among parts that resolves problems that would exist if the relationship were missing. They are not formulae or algorithms, but rather loose rules of thumb or heuristics as a morphological law, a relationship among parts within a particular context.

The architect Alexander (1997) developed, and it has become widely adopted, a 'pattern language. A pattern language consists of a hierarchy of parts, linked together by patterns which solve generic recurring problems associated with the parts. Each pattern is characterised and codified and the collection of such patterns forms a language for design. Such patterns are not isolated since the structure of the language as a whole is composed of the links from larger patterns to smaller patterns, which together create a network. For a single pattern to work fully, it must not only be followed through by implementing the smaller patterns and when completed this single pattern must, if at all possible, be connected to certain larger patterns. In Alexander's words: *"In this network, the links between the patterns are almost as much a part of the language as the patterns themselves."* (Alexander, 1980).

These characteristics of a pattern language echo in many ways the basic definition of the system. However, the attachment of the word 'language' to 'pattern' reminds us that, in architectural

design, this is a method used by human designers to help them respond to human needs and therefore is an aid to a reflexive process. Again it might seem in the software field that pattern language is first order and objectified, but in so far as the software is designed to serve human need in a way that leaves the user comfortable, then again, there is a degree of reflexivity.

Another aspect of pattern is how far the pattern itself is circumscribed to a particular domain. Some patterns, like fractals, can be infinitely recursive and appear unbounded limited only by the viewing scale. However, systems of interest in practical affairs are usually bounded in some way. However, the determination of the boundary and content of a given pattern can be arrived at through boundary critique. An integrated theory of systems and futures needs to have a way of examining and reflecting on the meaning and identification of boundary conditions and the extent to which there are options based on different assumptions.

Boundary critique (Ulrich, 1983, 2005) makes a link between people's value judgements (about what purposes it is appropriate to pursue) and boundary judgements (what they see as relevant to those purposes). Value judgements imply a self-directing consciousness, as we saw in the nature of appreciative systems.

In both systems and futures work, there are often contested areas and clashing values that determine perspectives. This could include reframing understandings of a conflict between stakeholders in developing strategy, by exploring different perspectives on their boundaries of concern (Midgley and Pinzon, 2011). Exploration implies learning, but it is not very common, in my experience, to examine the relationship between decision and learning in the domain of corporate management.

Reflection on Chapter 4

The challenge here is to reflect on the nature of reflection. In my own experience there have been different strands related to this.

One strand has been my own personal, private search for self-understanding and ways of working to be more aware of what is going on in myself, linked to my own quest for meaning. These practices have had considerable influence on where my interests have been in management development and strategic decision making. However, these personal perspectives have not been something overtly entering my professional work.

The other strand is my professional interest as an organisational development consultant in the nature of process consulting and the impact of group dynamics. In the first area, the works of Schon (1983) and Argyris (1990) have been particularly helpful. In the second area, the work done by the Tavistock Institute, especially the formulation of basic assumptions in groups by Bion (1961), has been influential. Working with perceptual distinctions between task, procedure and process, and the lack of congruence between these that is often found in groups, convinced me that a strictly

'objective' view of what was going on simply didn't make sense. From Bion's (1961) work I found particularly helpful his distinction between the overtly stated task of the group and its psychodynamic behaviour, which can pull a group in entirely different directions, usually with psychodynamic behaviour disabling the overt purpose. Both of these strands of research led me to the facilitated approach to group decision support that I now commonly use in my consultancy practice.

As I became more and more interested in facilitation, I also became aware that the process schools (Schon, 1983 and Argyris, 1990) with their rule of detachment from and non-involvement in tasks as such, feeding back only on individual and group behaviour, were stuck when it came to the importance of new ideas and new thinking. Another critical thread for me has been the treatment of creative thinking as an intentional discipline with its own psychology and practice (I go into this area in Chapter 9 on the Challenge of Reperception) as well as the recognition that thinking could be greatly enhanced by harnessing aspects of the brain that the world of words and numbers alone cannot activate. Here I refer to visual facilitation.

Visual facilitation itself could be a relatively passive recording, sketching whatever comes up in a conversation without transforming it into new thoughts. It is this realisation that took me into systems thinking and modelling.

As part of the thread of exploration of visual thinking, I invented the hexagon mapping technique (Hodgson, 1992) which also became a useful knowledge elicitation tool for developing system dynamics models. This enables members of a working group to involve themselves in interactively developing new layers of thinking by the flexible re-arrangement of ideas in the form of icons (named as 'idons'). This approach to group working was termed '2nd level conversation' by Kees van der Heijden (1989).

However, in reflection on all of this, when I largely switched from consulting to research in 2004, I still felt frustration with how these various methods actually improved decision making or not. It was at this point that I discovered the work of Heinz von Foerster (1979, 1995) and the ideas of second order cybernetics. It seemed to me that bringing all this together might create a new perspective on both the successes and failures of the field of decision support.

But there was still the question of futures methods and decision making. The contradiction that became clear in this area was that systems science and complexity science were revealing a new perspective on complex emergence, circular causality and multiple parallel structures and patterns that was not matched by the dominant, linear, deterministic treatment of time. It seemed to me incongruous that 'stuff' was seen to be complex, but time was treated as essentially simple, relativity notwithstanding.

The Chapter 5 moves on to consider reflexive thinking about time.

****

Chapter 5: Thinking Reflexively about Time

5.1 The Nature of Reflexivity in Time

Our way of relating to time is generally very much taken for granted. Because of this we are often unaware of the simplistic and disjointed assumptions we make. A major example is the pervasive paradigm of physical and social time measurement we make (simply, clock time) that determines and constrains the meaning of time and thus leaves many unexamined assumptions. Reflexivity in time is an enquiry into our experience and into clarifying those assumptions. On this basis it then becomes possible to explore other ways of understanding the nature of time and widens our options for relating to time. In this area we do not have an established discipline, like cybernetics, which distinguishes between first order and second order time. However, some philosophers (Callender, 2011; Markosian, 2014), have deeply considered the nature of time and have proposed a more interesting and complex interpretation than the dominant paradigm. And some psychologists have done research into phenomena and experience which are considered anomalous in the dominant paradigm (Seligman et al, 2013), (Price, 2012). Further, some physicists have explored and made claims for controversial notions, for example, like time reversal.

Introducing the basic nature of reflexivity to the consideration of time changes the scope of this inquiry. The first point to consider is that someone, some person, is experiencing what they call time. This is equivalent to second order, because in this view, time itself is not separate from the experience of time. This is very different from the reductionist removal of time into the world of clocks and planetary cycles observed 'from the outside.' The second point to consider is that the experiencing subject reports on time experience in a much more varied way than the singular ticking of a clock. For example a subject may report that 'time flies by' in one situation and 'drags interminably' in another. The third point is that multiple subjects coexisting in the same time zone may experience moments in time with different qualities of meaning. For example, several people may catch a train at the same time and share getting on the 8:15am to wherever. Two of these people may, in getting on that train, experience a meeting with each other which both intended at some previous time but did not think it was possible to arrange. They would describe this as a 'happy coincidence', and the moment of 8.15am would come to mean something different from just the moment a train was boarded. Of course, this insight shows that it is the happening in both space and time that create the meaning, not time alone.

The Greeks made a distinction between time as *chronos* and time as *kairos*. Chronos, from which we get the term chronometer, refers to the recurring daily time sequence of one thing after another; in other words, clock time. On the other hand, kairos refers to some event or incident that is

considered timely; one of those occasions when things come together in an effective or satisfying way. “You're getting on the train at this time is very timely because I was keen to meet with you but did not have your phone number.”

Reflexivity in time opens up even wider possibilities that there may be more going on in time then we have hitherto acknowledged and paid attention to. One example, that will be gone into much more fully later, is the idea of potential or latency. There are times when we have a sense of more being possible than would be predicted by things carrying on as they currently are. This is often the case when we are faced with a choice. Let's say on a given day we could meet with an old friend or go to a talk on a matter of importance to us. In the first case there is the potential to catch up on old times and perhaps refresh the relationship. In the second case there is the potential to gain information that could be of significant value for your work. At the moment of choice both are latent in the situation. They are not in time already, but have significant temporal implications. The relationship between latency, time and decision is critical to better understanding decision-making.

A great deal of futures and foresight work is undertaken or commissioned by people who essentially regard the future as an extension of the passage of time around which they would like to be informed by an accurate or reliable forecast. This essentially deterministic approach enables decisions to be made with confidence because the future has been taken into account. A foresight technique like scenario planning is deliberately structured to try and loosen up this deterministic orientation and acknowledge the reality of uncertainty about the future. Several alternative versions of the future are created with the idea that proposed decisions can be tested in different scenarios to see if they are likely to perform as intended. In theory each scenario in the set is equally likely or unlikely. However, in my experience over many years, decision-makers have a tendency to seize one of the scenarios as a forecast and reject the plausibility of the others in spite of their rational justification.

Another aspect of futures work is the whole idea of, for example, technological forecasting, which retains its position through a high degree of success. However, this only operates effectively in certain domains (for example, Moore’s Law[7] in computing). In areas where there is high social interaction with technology, linear extrapolation rarely works. As in the discussion on reflexive systems, people have reflexive relationships with technology and how it unfolds over time (Strijbos & Basden, 2006).

All these considerations raised the question that when futurists or foresight practitioners are in some way forecasting, speculating on, or anticipating the future, what do they mean by ‘the future’? There is no adequate theoretical underpinning of futures work (Poli, 2013) that would give us a quick answer here. There is little discussion of the nature of time in a way that enriches its meaning and

[7] "*Moore's law*" is the observation that, over the history of computing hardware, the number of transistors in a dense integrated circuit has doubled approximately every two years.

changes the options for practising anticipation. If time is simply left as calendar time (doing scenarios for 2025) or causal time (telling a story from here to a point in the future) then there is little scope for upframing this area in a way that can interact with the upframing of the nature of system. The rest of this chapter lays the groundwork for a richer picture of the nature of time that can be worked with in an integrated manner.

5.2 Reframing the Notion of Future

I believe the important reframing that gives more room for investigating integration is stepping out of the confines of linear time as a way of thinking about the future. The classical version of linear time is an extrapolation of past trends into the future.

A transition step in the pathway to changing our concept of time from a simple linear flow (time's arrow) is to acknowledge the importance of anticipatory systems in which such a system incorporates, in some way, a model of the anticipated future that prompts action, not based entirely on the past. A conventional, first order view of time might see the anticipated future as merely in the present, but remember that from a second order perspective, the *anticipator's perspective* on time is what matters. Therefore, the *anticipator experiences* a projection into the future that influences action in the present: a concept of feedforward (the projection) can be introduced to balance the concept of feedback to the present. From a decision making point of view, a linear, predictive approach to the future is not adequate.

Another issue is that often a scenario set of multiple futures prompts a bias towards dystopia or utopia. Slaughter (2004) analyses this tendency fully in his work on dystopia. Ogilvy's (2011) idea of the 'scenaric stance' also addresses this: he says that we are challenged to entertain both heaven and hell in equal measure and reserve the capacity of direction and choice in the face of that. Miller (2011) points out that this is a stance which acknowledges our need to go beyond the polarity of positive or negative futures and entertain unknown, creative possibilities and seek multi-criteria outcomes. The rational account is insufficient; we need to make a distinction between our intellectual descriptions of the present and the future and our actual experiences of them. Bergson (1910) provides us with a philosophy that separates the direct experience of time and space from the manner in which we describe it intellectually. Commenting on the mainstream rational philosophical positions of his time, he states that:

> *"They did not see that intellectualised time is space, that the intelligence works upon the phantom of duration, not on duration itself, that the elimination of time is the habitual, normal, commonplace act of our understanding, that the relativity of our knowledge of the mind is a direct result of this fact, and that hence, to pass from intellection to vision, from the relative to the absolute, is not a question of getting outside of time (we are already there); on the contrary, one must get back into duration and recapture reality in the very mobility which is its essence"* (Bergson, 1910, p31).

Poli (2011) goes further to affirm that we need to enlarge our notions of dimensionality and consider an ontology of the future. Bennett (1966) articulates a powerful notion of the present moment that has an experiential basis. The essence of this view of the present moment is that, in our experience of now, the so-called flow of time is only one of three major determining conditions of the future. We must also include latency or potential pattern (See Hodgson, 2013) and commitment and freedom to choose, which also allows for the creation of possibilities.

The domination of the reductionist paradigm of science, where the state of the observer is disengaged from the observation data, has generally obscured and side-lined investigation of the time experience. However, there is a significant history of such investigation. Dunne (1927, 2001), partly inspired by the work of Hinton (1887), became very interested in those experiential phenomena, especially revealed through dreaming, which implied some form of precognition. With an engineering mind he was careful to examine misinterpretations of his observations that would be inconsistent with information about future events. Only by extending the interpretation of common sense dimensionality could he begin to give an account of inconsistencies with linear time.

McTaggart (1927) extended the idea of time to include two kinds distinguished by the way of ordering positions in time. First, ordered by the relation of *earlier than*, which gives us a series, which McTaggart calls *the B-series*. A second ordering is imposed by designating some moment within the B-series as *the present moment* called *the A-series.* According to McTaggart, in order for time to be real, both series must exist, although McTaggart holds that, in some sense, the A-series is more fundamental than the B-series. Unlike the case made in this work, McTaggart argues that the A-series does not actually exist. McDaniel (2013) summarises the position thus:

> *"Although there are various ways to reconstruct McTaggart's argument, for our purposes it will suffice to consider the following one:*
>
> *Time is real only if real change occurs.*
> *Real change occurs only if the A-series exists.*
> *The A-series does not exist.*
> *Therefore, time is not real."*
>
> (McDaniel, 2013, p68).

McDaniel (2013) points out that time is treated as a dimension but that the meaning of dimension is that there is an entirely different way of measurement or characterising the phenomena we are dealing with. In this sense there are possible any number of distinguishing such characteristics – but we do not have names for them. We can think of these differences as being orthogonal to each other – though not limited to Euclidian space. Mathematical physicists consider schemes of more than 10 dimensions, for example. The limitation is more our capacity to visualise such multi-dimensionality since our mode of perception is conditioned by the three dimensionality of our own constructions.

I propose in Chapter 8 an extension of dimensionality that takes the present moment time to include time as real, but not the only determining condition of that present moment. The present moment contains a diversity of dimensionality greater than the space and time of either the common sense view point or the 'block universe' of a four dimensional space-time continuum.

There is a growing body of research coming closer to the mainstream than indicates that human minds are not as restricted as McDaniel (2013) asserts. For example, Seligman et al (2013) have proposed that we have a normal capacity to anticipate the future:

> *"We suggest an alternate framework in which people and intelligent animals draw on experience to update a branching array of evaluative prospects that fan out before them. Action is then selected in light of their needs and goals. The past is not a force that drives them but a resource from which they selectively extract information about the prospects they face. These prospects can include not only possibilities that have occurred before but also possibilities that have never occurred—and these new possibilities often play a decisive role in the selection of action."* (Seligman et al, 2013, p119).

The researches of Radin (2006) suggest evidence for capacities that operate outside the boundary of conventional space-time. It may be, as Targ in Dunne (2001) suggests, that if we do not entertain the possibility of such capacities we will not carry out the investigations and experiments that reveal it is a real possibility. This has already been demonstrated in his work with colleagues on remote viewing, which challenges our conventional view of the mind's relationship to space.

> *"The data from dream research like J.W.Dunne's and from remote viewing research provide evidence that our minds have access to events occurring in distant places and to the future or past. ... Dunne proposes an elaborate theory of "serial time," in which our consciousness has access to time's many dimensions. This geometric approach is very much in line with physicist John Archibald Wheeler's statement that our understanding of physics will 'come from geometry, and not from the fields.'"*(Targ in Dunne, 2001, p ix).

Kant also makes the point that space and time are modes of human perception, and are not attributes of the physical world. These modes are considered to be filters of our own invention.

The task of reframing our everyday understanding of time takes us into the area of phenomenology. A suitable bridge is a proposition about the future made by Heidegger:

> *"To designate the authentic future terminologically we have reserved the expression 'anticipation'. This indicates that Dasein*[8]*, existing authentically, lets it come towards itself as its ownmost potentiality-for-Being – that the future itself must first win itself, not from a Present, but from the unauthentic future. If we are to provide a formally undifferentiated term for the future, we may use the one which we have designated the first structural item of care – the 'ahead of itself'. Factically, Dasein is constantly ahead of itself, but inconstantly anticipatory with regard to authentic possibility."* (Heidegger, 1926, p386).

How I interpret the meaning of this as a foundational thought for exploring the reflexivity of time and the future hinges around the word 'anticipation'. Heidegger implies that authentic grasp of

[8] *Dasein* means 'being-there' or more colloquially 'showing up'.

the future is more than 'seeing into the future' but incorporating that sense of future as realisation of possibility which appears to us as that which is 'ahead of itself'.. This will be easier to unravel when the idea of multidimensionality proposed in Chapter 8. The nest step in my argument is to extract some key thoughts from Husserl's approach to time consciousness which, of course, was known to Heidegger.

5.3 Husserl's Model of Time Consciousness

In his comprehensive work, *The Anthropology of Time*, Gell (1992) states, with regard to the phenomenology of time, that *"Husserl's theory deserves to be considered in detail, because it remains the most careful and intricate account of subjective time available to us, even after all these years."* P222. Husserl (1903-1917) developed his theory and from views held by his teacher, Brentano, regarding the problem of the continuity of the perceptual present in contrast to the conventional idea that the present is a knife-edge between the future and the past. For example, if we are listening to the sound of a clarinet lasting seven seconds we hear it as a continuous duration. When we get halfway through to the fourth second, the sound of the first second is no longer audible. In terms of our experience, however, it is still a component of the present tone that we are hearing. Also, the recent past is fed forward into the auditory signal and anticipates the perception of a temporally continuous time-object (i.e. a tone that endures).

Husserl (See Gell, 1992) pointed out that the experience of the earlier part of the sound in our experience is not the same as a memory of that sound. It has a certain immediacy that is not a qualitative property of a memory that we heard a clarinet sound previously. Husserl made a distinction between retentions of experience and memories. He also introduced the notion of *protention* as a horizon of a temporarily extended present. The idea of a knife-edge present, a thin instant, is abandoned. Retentions are qualitatively different from memory reproductions in that they are all part of the current consciousness of the present. Protentions are the emergent proximate future distinguished from fantasised futures.

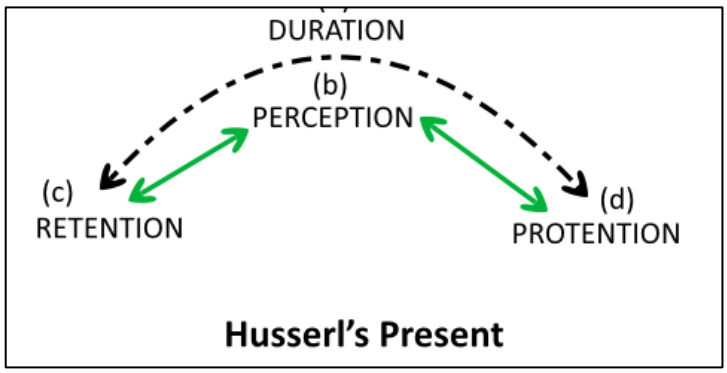


Figure 5.1 Perception extended in duration by retention and protention

Since the time of Husserl, there has been considerable accumulation of psychological and neurobiological evidence that our experience of time is not one simple form. This is a massive field in itself, but a leading researcher, McGilchrist (2009), has reviewed the entire field from the perspective of the asymmetry of the brain (differences in function of the left and the right hemispheres) and concludes the following:

> *"But sequencing, in the sense of the ordering of artificially decontextualised, unrelated, momentary events, or momentary interruptions of temporal flow – the kind of thing that is as well or better performed by the left hemisphere – is not in fact a measure of the sense of time at all. It is precisely what takes over when the sense of time breaks down. Time is essentially an undivided flow: the left hemisphere tendency to break it up into units and make machines to measure it may succeed in deceiving as that it is a sequence of static points, but such a sequence never approaches the nature of time, however close it gets. This is another instance of how something that does not come into being for the left hemisphere is re-presented by in a non-living, mechanical form, the closest approximation as it sees it, but always remaining on the other side of the gulf that separates the two world – like a series of tangents that approaches ever more closely to a circle without ever actually achieving it, a machine that approximates, however well, the human mind yet has no consciousness,"*
> (McGilchrist, 2009, p76).

Husserl's model of time consciousness is consistent with the research that places the experience of presence and wholeness with the right hemisphere and distinguishes it from the 'one thing after another' notion of time consistent with the left hemisphere, or McTaggart's B-series. McTaggart's argument that time does not exist because the A-series is present in a non-existent linear B-series falls into the trap of framing the issue from the left hemisphere. The primacy of experience is in the right hemisphere so that McTaggart's argument needs reversing. *The B-series is not real because it is an abstraction from the experience of the A-series of present moment awareness*. Time's reality is as the A-series of present moments. To sum up in McGilchrist's (2009) words:

> *"It has often been said that the left hemisphere is the hemisphere of linear processing; its cognitive style is sequential, hence its propensity to linear analysis or to mechanical construction taking the bits apart or putting them together, one by one. ……. By contrast the shape that is suggested by the processing of the right hemisphere is that of the circle, and its movement is characteristically 'in the round', the phrase we used to describe something that is seen as a whole, and in depth."* (McGilchrist, 2009, p 446-447).

There is another interesting perspective emerging from brain research associated with what is called a default network. This is a set of interconnected regions active in internally directed mentation. The initial curiosity around the default network is that it was assumed that when a research subject was not engaged in a task and was resting, that the activation levels would go down. It was found however, that the resting state had a stable and uniform pattern of activation. Further research came to the conclusion that the so-called resting state showed a pattern of enhanced activations which are occupied with "figuring things out" or perhaps more accurately, patterning things out. *" …the intriguing idea [is] that when people are at rest and not engaged in some externally directed task, their mental lives are largely occupied by imaginative simulations."* (Seligman et al, 2013, p128).

These imaginative simulations include episodic memory of the past and prospective representations of the future, implying that brain function is in some sense holding these together in a dynamic exploratory present. The idea that one part of the brain will deal with the past and another part of the brain will deal with the future seems to be demonstrably incorrect. The mind appears to be juggling multiple time related factors within the same default neural network.

> *"Buckner and Carroll (2007) conjecture that the fundamental function of the core neural network implicated in episodic memory, thinking about the future, counterfactual reasoning, mind reading, and spatial navigation is simulation. An ability to project oneself into other times and other shoes could have held an evolutionary advantage strong enough to shape neural architecture itself, and the existence of a core brain network that supports prospection and other forms of imaginative simulation constitutes the fourth and final form of our argument."*(Seligman et al, 2013, p129)

My conjecture, based partially on the above considerations, is that the psychological and the philosophical foundation for a synthesis of systems and futures needs to incorporate some aspects of the phenomenological perspective, and derived principally from experience rather than the abstractions of conceptual systems and conceptual futures. Having said this, it is nevertheless necessary to incorporate the representational languages of the left hemisphere in elaborating the implications for synthesis. In this sense, we need the contributions of the whole brain to make the best sense we can of the task.

Sokolowski (1974) reflects on Husserl's teaching and sums up this central point as follows:

> *"Very often the surprising and disturbing element in Husserl's doctrine is the fact that certain things we have become accustomed to take as independent turn out to be dependent moments when they are considered from a new viewpoint. A material thing, for instance, is naturally taken as concrete and independent, but phenomenologically it is considered as dependant and founded on consciousness; the world itself, which is taken as the most encompassing whole in the natural attitude, turns out phenomenologically to be enclosed within a still wider totality, that of the consciousness which has a world (within pure subjectivity)."* (Sokolowski, 1974, p12)

Fuenmayor and Lopez-Garay (1991) have also proposed a phenomenological approach to systems which he calls interpretive systemology. I am not concerned directly here with his claim that interpretive systemology can equally carry out the tasks of the critical systems approach, rendering the latter redundant (Fuenmayor, 1991, 1993, 1997). I am more concerned with the rebuttal of this position by Mingers (1991, 1992) who discounts the phenomenological approach the three ways in which criticisms might also be levelled at my approach. Mingers highlights four criticisms: first that phenomenology is divorced from practice; second that it is focussed in individual being excluding the intersubjective; third, that it is universal and the same for each person; and fourthly that it denies a 'world out there' with an antirealist ontology.

A transdisciplinary approach (Nicolescu, 2007) challenges us to entertain both viewpoints simultaneously. What I find valuable in Husserl's description of the present as bounded by *retention*

(distinct from memory) and *pretention* (distinct from imagination) is the recognition of the second-order nature of time perception. However, in my view that time perception is also situated in a real world context, and so is not unrelated to and implicated in practice. This will be most fully explained in Chapter 16.

This embrace of the internal subjective phenomenon and the outer objective world has emerged in the further development of phenomenology (Carman, 1999) especially in the work of Merleau-Ponty (1962). He uses the experience of the body as a focus in exploring the relationship between the subjective experience and the encounter with the world.

> *"… my body is geared to the world when my perception offers me a spectacle as varied and as clearly articulated as possible, and when my motor intentions, as they unfold, receive from the world the responses they anticipate. This maximum distinctness in perception and action defines a perceptual* ground, *a basis of my life, a general* milieu *for the coexistence of my body and the world."*(*Merleau*-Ponty, 1962, p250 quoted from Carman, 1999, p217).

Since I am privileging a second-order science perspective in this work the relationship between subjective experience (phenomenological) and the external world (realist) needs to be clarified since we are dealing with the body of the world not simply my body. A useful transition in this thinking is the development of critical or transcendental realism by Bhaskar (1988). His approach combines the subject-dependent nature of knowledge with the view that the objects of our knowledge have independent existence, admittedly only known through an interaction with the subject. This framing is particularly important if the best of systems science is to be integrated with the best of futures studies. My position is that engagement with 'the future' is predominantly a matter for the subject (even though futures work is peppered with data, statistics, trends etc) whereas systems science is more grounded in the functioning of the world. This is not intended to be a black and white distinction, but rather a matter of emphasis that enables the two fields to be brought closer together. This passage from Bhaskar sums up the position:

> *"It should be appreciated that all philosophies, cognitive discourses and practical activities presuppose a realism—in the sense of some ontology or general account of the world—of one kind or another. The crucial question is: what kind? The scientific, transcendental and critical realism which I have expounded conceives the world as being structured, differentiated and changing. It is opposed to empiricism, pragmatism and idealism alike. Critical realists do not deny the reality of events and discourses; on the contrary, they insist upon them. But they hold that we will only be able to understand—and so change—the social world if we identify the structures at work that generate those events or discourses. Such structures are irreducible to the patterns of events and discourses alike. These structures are not spontaneously apparent in the observable pattern of events; they can only be identified through the practical and theoretical work of the social sciences."*
> (Bhaskar, 1988, p2).

The system sciences have extended their reach into the subjective through such developments as soft systems methodology (Checkland, 1981), critical systems (Ulrich, 2005), boundary critique

(Midgley, 2000) and interpretive systemology (Fuenmayor and Lopez-Garay, 1991). The phenomenological approach has increasingly being introduced into scientific method through interest in developing a science of qualities (Goodwin, 1997, 2007) and a recognition that understanding of wholes rather than assemblages of parts is a critical aspect of scientific insight (Bortoft, 1996, 2012).

With the notion of reflexivity now established in both the approach to system and the approach to time and the future, in the next chapter I will begin to assemble the basis for a synthesis of these two fields.

Reflections on Chapter 5

Although my undergraduate education included thermodynamics and the "the heat death of the universe", I could not reconcile this back then with my experience and questions regarding meaning. My education had also included an intensive exposure to music and literature. At that time in the early sixties, the debate on C. P. Snow's (1959) *Two Cultures* was going on, and I felt the tension he expressed since I valued both the sciences and the arts. I became very interested in additional interpretations of experience beyond 'time's arrow'. These questions were intensified by personal experiences that I was unable to reduce to 'brain chemistry'.

From this background my interest grew in multi-dimensionality, both as an aspect of physics and cosmology as well as an aspect of psychological states. This is what led me first to J.G. Bennett and then to David Bohm, who framed the questions on a much larger canvas. My position that emerged was that 'any science is done by a scientist'; but the issue of the observer and the observation was still unclear, especially in relation to time.

Relativity and quantum theory placed the observer back in the frame to some extent, but was kept by the official scientific community in a mental box that was insulated from human experience. The emergence of second order cybernetics and second order science did not come to my attention until my consulting activities wound down and my research activities came into play. But I still found the underlying assumptions about time that were in the background (or underground) of systems science and futures studies were sparse and disjointed. It seems to me that just as we have taken on a principle of variety in stuff and space, so we need to do likewise in time and events.

In this reflection I can illustrate the basics of this question from Shakespeare. Firstly there is the ubiquity and unavoidability of what we call time:

"We are time's subjects, and time bids be gone." [9]

This suggests the 'perpetual perishing' inherent in the time experience and the inability to 'wind back' time and take another choice or make commitments over again.[10] It is 'now or never', as Hastings

[9] Henry IV Part 2, 1.3.8

[10] Although fringe notions such as Ouspensky's notion of recurrence question this limitation in the context of a wider complex of dimensions that conventional space and time (Ouspensky, P.D., 1931,.Chapter

declares to Mowbray. Where we lose that control over repetition of time, we also can lose meaning expressed in the (meaningful!) words of Macbeth:

> *"To-morrow, and to-morrow, and to-morrow,*
> *Creeps in this petty pace from day to day,*
> *To the last syllable of recorded time;*
> *And all our yesterdays have lighted fools*
> *The way to dusty death."*[11]

In my reflection this is the outcome of a time arrow heat death 'signifying nothing'. What Macbeth is missing, Banquo appreciates but cannot access, although he suspects those who claim to do so are suspect:

> *"If you can look into the seeds of time,*
> *and say which grain will grow*
> *and which will not,*
> *speak then unto me".*[12]

Yet there is another quality we often refer to as 'timing'. Something is possible at this moment that may not be possible at a later moment and could not have been at an earlier moment. Brutus affirms to take his chance:

> *"There is a tide in the affairs of men.*
> *Which, taken at the flood, leads on to fortune;*
> *Omitted, all the voyage of their life*
> *Is bound in shallows and in miseries.*
> *On such a full sea are we now afloat,*
> *And we must take the current when it serves,*
> *Or lose our ventures"*[13]

The Greeks kept a separate word for this aspect of time, *kairos*, to distinguish for the linear time of kronos. So from a reflexive point of view it has seemed to me for some time that what we call time is a richer aspect of the universe, and our experience of it, that requires at least three dimensions. I will summarise these simply as

Time – what we measure by clocks and chronometers

Timeless – what we sense as potential

Timely – what is meaningfully actualised

The idea of three dimensions of time is explored in Chapter 7. First, Chapter 6 takes a further step in relating together systems and futures.

****

Xi, *A New Model of the Universe: Principles of the Psychological Method in its Application to Problems of Science*, Knopf, New York

[11] Macbeth, 5.5.19

[12] Macbeth, 1.3.61

[13] Julius Caesar, 4.3.218

Chapter 6: Systems and Futures – A Synthesis

6.1 The Approach to Synthesis

Most academic approaches to synthesis of research tend to be rooted in the first order paradigm. In this approach emphasis is placed on a comprehensive review of the relevant literature followed by distillation of most significant findings followed by some kind of review of the state of play in the research. Clearly this approach is of considerable value in a number of ways, but it does not address the challenge here to integrate structure and anticipation of the future, which is rooted in the second order paradigm. In other words my personal thinking is as much a substantial component of the research as is the inventory of other people's thinking.

More relevant for my approach is the idea of an interpretive synthesis. Weed (2005) points out that a basic research synthesis, bringing together the discussion of results, findings and conclusions of previous studies, is characteristic of pretty much every research project. He then points out that it is rare for this type of secondary review of research to be presented in anything other than a descriptive way, perhaps indicating gaps to fill. His review of this field introduces the idea of meta-analysis techniques which go a stage further, for example in the medical field, by supporting evidence-based policy.

He then takes this further still, to the idea of interpretive synthesis, especially of qualitative research and terms this *meta-interpretation*. His own synthesis of different approaches in this vein, leads him to propose a generic approach to meta-interpretive synthesis. In his review he quotes Strike and Posner (1983):

> *"Synthesis is usually held to be activity or the product of activity where some set of parts is combined or integrated into a whole… [However, syntheses} …. involve some degree of conceptual innovation, or employment of concepts not found in the characterisation of parts."* (Strike and Posner, 1983, p343).

The aspect of synthesis that is the fundamental core of my own work is indeed conceptual innovation. Theory developments, especially in areas which are not amenable to quantitative measurement, require speculative imagination as well as careful review of what has gone before. This is especially so, as in this work, where many diverse perspectives and disciplines are being drawn on. Put simply, strong meta-interpretative synthesis requires the generation of ideas, the formulation of them in a manner that links back to the incorporated material from the gathered together disciplines, and avoidance of premature judgemental closure to enable the ideas to incubate and take clear form through iterations of interpretation and reconceptualisation.

6.2 Reframing System and Reframing Time

The analysis of systems and futures so far has focused on opening up some room to manoeuvre in attempting a synthesis. The overarching proposition is that remaining in the first order paradigms of complete separation of the observer and observation to attempt a synthesis is not going to be meaningful or even possible. I will name going beyond the separation the reflexive approach. Some of the ingredients from this reflection that need to be woven into the discourse are as follows:

A key characteristic of a system is a sufficient degree of relative autonomy yet being interactively embedded in its context or environment. Koestler (1967) names this the Janus principle after the two headed Greek God. In any holarchy of holons[14] there is a dynamic balance between autonomy and integration. Any system is observed as such by an observer, who to varying degrees, participates in the system. The detached observer is a reduction from the more complex interactive situation. Further, in human systems the property of self-observation is critical in that such systems can be both learning and creative. This is not simply an extrinsic capacity but is a property of embedded cognition which can enable a system to exercise intrinsic choice. All such systems are patterns within larger contextual patterns, and are inherently open and uncertain.

In my view time is not restricted to the common linear viewpoint of clock time and time's arrow. Time also has characteristics of circularity and recurrence, which become clearer from reflection on present experience. In this approach, primacy is placed on the present moment and the flow of linear time is only one aspect of the present. This opens up the possibility of a phenomenological approach to time that leaves room for qualities of time-like experience. Such qualities and associated dimensions at first glance may appear imaginary abstractions, but there is evidence from several disciplines that there may be much more to this viewpoint than imagination. Framing in this way provides a space for considering multiple contexts of time.

Some common themes between systems and foresight are that both are interested in behaviour and change over time; both are concerned with structural shift, in the sense of structure driving behaviour and episodes of time in different paradigms or contextual structures; both are concerned with enduring structure, deconstruction of those patterns through collapse or disruptive innovation, and both are providing platforms for the recognition and creation of new factors to take into account.

To take this further requires a new synthesis around the question of the boundedness of systems enduring over time. An extension of boundary critique is required to take into account time as well as space. Initially, boundary critique was introduced by several authors interested in systemic

[14] Koestler (1967) defines a holon as something that is at one and the same time both a whole and a part. A holon has the characteristics of both autonomy (independence) and integration (a component of something greater) which gives it a seemingly contradictory nature; hence the Greek myth of the two faced god Janus to symbolise this property. A holarchy, then, is a hierarchy of self-regulating holons.

intervention (Ulrich, 1983, 1988, 1994, 2000, 2005, 2010; Midgley, 2000.) Systemic intervention is designed to address problematic situations which are informed by reflections on boundaries (Midgley, 2000). As well as considering a system in terms of its meaning, content and relationships, we can include its boundedness in past, present and future. As we shall see, consideration of a present moment implicitly assumes or defines the scope of a boundary. This is treated in more detail in Section 14.1.

Psychologically, this time boundary is determined by both the duration of attention and concern over time, and the richness or variety of the content under consideration. A present moment is complex, non-linear and generative of emergent properties including those influenced by understandings of the future. Midgley and Pinzon (2011) make the point that, prior to the work of Churchman (1970), systems thinkers assumed that the boundaries of a system are given by the structure of the system itself. Churchman questions this by proposing that the boundaries of a system are defined by the limits of the knowledge that is taken as pertinent by the observer. Where time-spans are introduced then this can be considered an enrichment of the second-order cybernetics position since time-span is observer determined.

In considering social systems as anticipatory systems, then, boundary critique can supply a rationale and method for supporting, not only clarification of the system in question but also the present moment including its latency or potential in which that system is being considered. The basic representation of boundary critique by Midgley is a spatial diagram circumscribing the domain of relevance and indicating that such a domain has a central value and identity. See Figure 2.1.

An example of this way of thinking is in conflict resolution. Two domains both overlap and clash. Systemic intervention introduces process *over time* that, if successful, moves the overlap and the value/identity clash into closer alignment and harmony. In terms of present moment theory, this can also be represented as the creation of a hybrid extended present moment that is inclusive of both original boundaries. The embrace of both parties is increased.

For the purposes of synthesis through an anticipatory present moment concept, I will start assuming a single boundary condition and present moment. After clarifying this, it should be possible to extend the concept to describe boundary and present moment situations with multiple relationships, incongruities or clashes.

Developed present moment theory needs to have a way of examining and reflecting on the meaning and identification of boundary conditions. The potentially strong integrative link with systems thinking here is the field of boundary critique in which significance is placed on

- the link between people's value judgements (about what purposes it is appropriate to pursue) and boundary judgements (what they see as relevant to those purposes), which helps us understand why scenario projects can surface conflicts and defensive routines in strategy work (Ulrich, 2005)

- how situations involving people who make different value and boundary judgements can result in ineffective assimilation and response to the messages of scenarios which challenge (as they should) current assumptions about the business environment (Midgley, 1992; Midgley and Pinzon, 2011).
- how people can reframe their understandings of a conflict between stakeholders in strategic formation, thereby making progress in addressing it, by exploring different perspectives on their boundaries of concern (Midgley, 2011).

Churchman pointed out that the positioning of boundaries of analysis in an intervention has important consequences, on how improvement is defined and its associated problems are managed. Boundaries filter what information is considered relevant and what is considered irrelevant. They are value judgements of the intervener. Churchman (1970) recommends that the boundaries of an analysis should be extended to 'sweep in' as much information as possible commensurate with being ineligible and the quality of an intended improvement should be tested in the from multiple perspectives. He equates the - most ethical viewpoint as the one that is the most inclusive.

For Churchman, boundaries define the limits of the knowledge that is to be taken as relevant in an intervention. For social systems, extending the boundaries of analysis may involve also greatly extending who may is considered a decision maker (Churchman, 1970). Setting boundaries affects the improvement of a system. This means that there are no 'experts' in Churchman's systems approach, who are considered to have all relevant knowledge: inclusive stakeholder involvement is required, encompassing a range of relevant perspectives. In present moment theory this is the equivalent of enriching the variety of the present moment.

Midgley (2000) points out:

> *"Churchman (1979) follows Hegel (1807), who stresses the need for rigorous self-reflection, exposing our most cherished assumptions to the possibility of overthrow. To be as sure as we can that we are defining an improvement adequately, we should pursue a dialectical process: this involves seeking out the strongest possible 'enemies' of our ideas and entering into a process of argumentation with them. Only if we listen closely to their views and our ideas survive should we pursue the improvement."* (Midgley, 2000, p137).

This is participative, second order discipline in which participants are highly interactive rather than, say, passive interviewees. Methods like Strategic Assumption Surfacing and Testing, SAST, (Mason and Mitroff, 1982), set up explicit oppositional debate in the relatively safe facilitated environment of a facilitated workshop. Mason and Mitroff's methodology is based on exploring jointly held assumptions can build enough trust and mutual understanding to explore differences and conflicts. The aim is to enable the group to discover for themselves what their differences are. A good result from a SAST workshop is the emergence beyond the either/or of a synergistic 'third way'. This can change the pathways open to a more aligned future relationship through time to a different future state. This is also the case in dilemma resolution as described in Section 14.4.

The capacity to take decisions *now* in relation to a *future* that is not evident from historical information is an anticipatory system (Rosen 1985). An anticipatory system incorporates in some way a model of the anticipated future that prompts action not based entirely on information in the present accumulating from the past. We have moved from the feedback of conventional first order systems to feedforward, which implies some additional second order capacity in the system to imagine or access information beyond the chronological. The notion of acting from signals of anticipation moves us from driving in the rear-view mirror to working out what lies beyond through the windscreen. Anticipation also requires the capacity to entertain more than one future and suspend judgement sufficiently for a reframing or reperception to take place (See Section 10.2). For example, simply having a set of scenarios is inadequate, since they are rarely given equal weight, especially if the background approach is biased towards dystopia or utopia. Ogilvy (2011) introduces us to the idea of the 'scenaric stance' in which we, as he puts it, entertain both heaven and hell in equal measure and reserve the capacity of direction and choice in the face of that.

The implication of this step is that we are now dealing with an agent, the decision maker, who can be purposeful, intelligent and creative. Miller (2011) points out that this is a stance which acknowledges our need to entertain unknowns, creative possibilities and seek multi--criteria outcomes. At this point we address the ontological questions that this raises. Bergson (1910) provides us with a philosophy that separates the direct experience of time and space from the manner in which we describe it intellectually. He introduced the term duration as a felt experience that is not reducible to clock time. Duration is intrinsically itself and cannot remain authentic if reduced to a spatial analogy.

Poli (2011) goes further to affirm that we need to enlarge our notions of dimensionality and consider an ontology of the future. Bennett (1966) proposed a powerful notion of the present moment. The essence of this view of the present moment is that, in our experience of now, the so-called flow of time is only one of three major determining conditions of the future. We must also include the aspect of latency, pattern or potential; and we must also include the aspects of openness, of freedom to choose commitment, and to create the previously non-existent.

Understanding the present moment begins with the question, "what are the different ways that we claim to know the future?" This epistemological question reaches certain limits in dealing with reflexivity, purpose and creativity. The ontological view proposes that the present moment is more fundamental than time in terms of the conventional assumptions of the nature of past, present, and future and 'time's arrow'. This present moment viewpoint seeks to change our way of interpreting and perceiving the nature of the future, how it might be anticipated, and even how it may be influencing the present in ways that our conventional thinking has not been able to grasp. So although philosophical and theoretical, there are implications for the world of practical affairs.

In conventional terms, we "know" the future in three basic ways. Firstly, we imagine that things which have happened in the past will in some way continue and repeat themselves in the future. Essentially this is about extrapolation and prediction. It assumes a world largely determined by linear cause and effect. Secondly, we observe a deeper structure of a current complex situation, perhaps recognising a pattern of relationships, and assume that the pattern will continue. There may be scope for a variation in the pattern, but the general shape of the future will be determined by it. Thirdly, and unusually, we may adopt a mental orientation that in some sense the future, or some critical aspect of it, already **is,** and is in some way influencing the present. In strict professional quarters this view is considered outside conventional academic disciplines, other than perhaps parapsychology and theology, but shows up in popular culture as notions of precognition, divinations and even prophecy. The status of these three interpretations will be discussed in Chapter 12.

The various tools and techniques of futures studies and strategic foresight adopt these different perspectives, albeit usually implicitly. For example, the notion of linear time is a dominant assumption behind techniques of extrapolation, whether algebraic or statistical. If these assumptions are not rendered explicit then it becomes difficult to develop both an underpinning theory for futures work and also difficult to construct a consistent critique (Poli, 2011).

The language associated with futures thinking can give us some clue as to what is needed in establishing a more robust ontology of the future. Viewed from the perspective of a decision maker, there are a number of keywords that imply a way of looking at the future that indicate what may be on the mind of the decision maker. In conversation about strategic issues these words keep cropping up as possible tools to understand better what the choice is, and what the context of that choice is. They include:

Predict - framing the future in an assumed known state

Foretell - being sufficiently informed to see the inevitable, even if unusual

Anticipate - recognising what needs to be ready ahead of time to secure a robust decision

Simulate - rehearsing a situation using a game or similar device that models and reveals a future state

Design - recognising that vision and initiative can bring about a different future from a current trajectory

Create - having creative power combined with enterprise to bring about a desired future

As a sample of the kinds of words and concepts that come up in applied futures work, these each reveal a different set of background assumptions about the nature of the future, the nature of the present and the nature of the past. A developed ontological view of the future aims to give us clearer criteria as to which of these could actually deliver good results depending on intention and

circumstances. We need to shift our focus of attention from the future to the *present moment* to gain a different perspective on the future. Most futures practice is concerned in some way with knowing the future better than if that work is not done but knowledge of the future is not an exact science in the normal sense; it has no data from the future to measure. Millett (2011) summarises five principles that he regards as basic to future studies and futures practice. They are:

> *"1 The future will be some unknown combination of continuity and change.*
> *2 The future can be anticipated with varying degrees of uncertainty depending upon conditions.*
> *3 Futuring and visioning are different but complementary perspectives of the future.*
> *4 The best forecasts and plans are methodically generated and provide well considered expectations for the future.*
> *5 There is no such thing as an immutable forecast or plan for an immutable future. Forecasts and plans must be continuously monitored, evaluated, and revised according to new data and conditions in order to provide real-time frameworks for making long-term decisions and strategies."* (Millett, 2011, p4).

In the above principles there are a number of implicit assumptions about the nature of time and about the nature of anticipation or forecasting. Some illustrative examples are provided below, divided into the conventional categories of past, present and future. Within each of these three categories some frequently applied methods that give structure to the futures discipline are listed.

Extrapolating from the Past

Extending historical trends: for example, demographic growth.

a) Partially predictable cycles: Kondratieff long cycles in the economy (Sterman, 1986). and long term coupling of finance and technology (Perez et al, 2007).
b) predetermined elements which deeply determine emerging events (Wack, 1985).

Potential in the Now

c) causal layered analysis (CLA) is a way to categorise different views of and concerns about the futures, and then to use them to help groups think about the futures far more effectively than they could by using any one of the 'layers'[15] alone, as most theory/methods do (Inayatullah, 2004).
d) structural simulation, including gaming and micro-worlds which help prepare organisations and individuals for alternative futures by bringing these futures to life interactively so they are imagined more vividly than would otherwise be possible. (Morecroft 2007).

Future Influencing the Present

e) retro causality is a concept that features in quantum physics, theoretical biology and psychology in which the future is considered in some way to exist and that it can

[15] The four layers of CLA are litany, systemic causes, worldviews and myth

influence the present (Benn, 2011). Approaches of the third kind mentioned above would require some version of retro-causality to hold true.

f) repeating cycles or waves such as long-run technological surges (Perez et al, 2007)

Each of these ways of looking at and into the future has systemic implications summarised below as a corresponding series of questions.

a) What is the complex system of coupling that is exhibiting the cyclical behaviour?
b) In what system are the pre-determined elements embedded?
c) What is the systemic relationship within and between the causal layers?
d) What is the dynamic system which forms the basis of the simulation?
e) What is the wider systemic context in which the anticipatory system is residing?
f) What is the complex of systems that is exhibiting a cyclical behaviour?

Reflections Chapter 6

In Section 4.3, I discussed the idea of pattern being a more fundamental upframing notion than system. Or put the other way round, system can be viewed as a special case of pattern. In Section 2.1 I made the distinction between the state domain and the pattern domain, reflecting on a more general formulation of pattern perspective and moment perspective. At this point it is useful to refer back to Bergson's point, quoted in Section 5.2, that in our languaging of time we tend to fixate, that is to hypostatise the experience of duration and moment as space or with spatial metaphors which risks assuming we have understood time. Never-the-less we can use spatial metaphors to good effect if we are aware of the implications of doing that. A good example will be Chapter 15 where the idea of three 'horizons' of time is discussed. So what might be a more authentic language of time?

At the moment of writing this I am listening to Scriabin's piano concerto. Although it is a work of the composer as a young man, it is quite complex. As I listen, I am aware of 'capsules' of melody and vibrations of unusual harmonies, both of which convey a feeling or mood. I can hear echoes of Chopin, an inspiration for Scriabin. But also there are very Scriabin characteristics I recognise from having listened to his later works. Something in the character of this music communicates a richer structure than simply 'one note after another'. I have never seen the score of this music but can imagine quite complex printed pages in some passages. Yet that pattern would not be meaningful without the performance 'in time'. However, a machine programmed to play this 'in time' would not, for me, convey the sense of the latent artistic creation that first Scriabin was bringing into being and has been further created by the performers.

The performance is over. But is the music over? Does it live on in more than a memory? In what sense is the piece of music still in existence? Is that only as a score printed on paper? Is the nature of the piece changed by multiple accumulating performances?

Clearly if there is a pattern in the experience of time then it requires three time-like dimensions of which only one is the ‘irreversible arrow’. Like the worm holes in science fiction and cosmological speculation, this gives the possibility of ‘time tunnels’ that shape our experience and our meaning.

A challenging consequence of this, no doubt vehemently dismissed in many quarters, is that the multi-dimensionality of human experience changes the very nature of possible science. That there some preliminary indications that this may not so far-fetched is the subject of Chapter 7.

****

Chapter 7: The Physics and Phenomenology of Time

7.1 Time in Modern Physics

The Brazilian American philosopher, Roberto Mangabeira Unger (Smolin, 2013) , asks the question, "In what kind of world and for what kind of thought is time real, history open, and novelty possible? In what kind of world and for what kind of thought does it make sense for a human being to look for trouble rather than to stay out of trouble?" Although I do not fully agree with his analysis of time, the spirit of this question I share. The question is, what kind of time is being taken to be real? There are some interesting views on time from notable scientists who have been brushed into the margin by mainstream science. To begin the task of opening up the nature and possibilities of time, some of these will be reviewed. A review of this field would require a volume in its own right and would require a more specialised investigation than I am carrying out here.. However, complex thought requires that it be taken into account as the basis of the conjectures about the present moment which follow in Chapter 8. Entertaining novel notions is integral to this thesis.

The laws which account for how radiation of all kinds propagates through space were discovered by James Clerk Maxwell (1865). Ever since then his equations have been one of the keystones of physics, standing up to the many developments since his era. These equations, in their full implications, are hard and tend not to be studied in great depth by most physicists. Especially resistant to consideration are those implications that challenge our conventional interpretation of time. Hoyle (1983) pointed this out:

> *"Because everyone of the special situations concerns radiation travelling in the usual time-sense from past to future, it passes almost unnoticed that there is another set of situations with radiation travelling in the opposite time-sense from future to past. So far as Maxwell's laws are concerned, this second set is just as good as the first. But custom dictates that the second set be tossed into the waste paper basket, the rejection being done with so little comment that for the most part one comes to accept the rejection of the future-to-past time-sense without being aware of it. Yet all experience shows that nature is very parsimonious, in the sense that where possibilities exist they seem always to be used. Is it conceivable, one can ask, that the possibility of a reversed time sense, future to past, is an exception, pretty well the only exception, to this general rule of natural parsimony?"* (Hoyle, 1983, p212).

Unfortunately, in my opinion, and increasingly in the views of some physicists and cosmologists, Hoyle himself was tossed into the waste paper basket of cosmology and theoretical physics, since his view of a steady-state creation was so diametrically opposite to the now dominant cosmology of the big bang, a term which, ironically, he first suggested!. However, even where a leading physicist is accepted at the Nobel Prize level, the implications of his thinking in this area are also brushed to one side. Feynman (1983), famous for his diagrammatic portrayal of transformations in fundamental particles (itself a remarkable example of the effectiveness of pattern thinking), also

held that the future influencing the present is part of the structure of the universe. The oft quoted gist of his theory is:

> *"A backwards-moving electron when viewed with time moving forwards appears the same as an ordinary electron, except it's attracted to a normal electron – we say it has positive charge. For this reason it's called a positron. The positron is a sister to the electron, and it is an example of an anti-particle. This phenomenon is quite general. Every particle in nature has an amplitude to move backwards in time, and therefore has an anti-particle."* (Feynman, 1986, p98).

In collaboration with another leading physicist, Wheeler, Feynman proposes that emitters are intrinsically symmetric so there is no intrinsic difference between so-called emitters and so-called absorbers[16]. If this theory is true, then radiation from a source is a time symmetric process, (past-to-future plus future-to-past) but the presence of an absorber makes it asymmetric (dominantly past-to-future).

Another way of decoding the physics really goes back to Hoyle's critique of the use of Maxwell's equations, mentioned earlier. It is the basic inconsistency in the way most physicists have only taken those aspects of their mathematical formulae which suit current dominant assumptions when the mathematics is indicating a much wider implication. An important case is that of quantum mechanics. Quantum mechanics derives its equations from Einstein's (1923) special relativity, such as the energy-momentum formula which links time, speed and mass.

The energy/moment equation which links energy, matter and movement:

$$e^2 = p^2 + m^2$$

in which e is energy, p is momentum and m is mass.

It follows that to solve this equation for e energy we need to take the square root of p and m function thus:

$$E = \pm\sqrt{(p^2 + m^2)}$$

Using this equation, Dirac (1928) identified the existence of the positron from which followed Feynman's statement quoted earlier. This opened up the whole field of anti-matter. The existence of the positron was proved empirically two years later, when Andersen demonstrated its existence in cosmic rays. Each atomic particle has a corresponding anti-particle, symmetrical in time and energy, which "flows from the future to the past".

The implication we are interested in here is the mathematical property that any square root can have a positive or a negative value. The question is, to what do these two solutions, the positive and the negative, correspond? Ross linked the existence of emitters and absorbers of photons to the interaction of *diverging* waves, which propagate from the past to the future, and *converging* waves, which propagate from the future to the past. The latter interpretation requires "the inversion of the

[16] Emitters give out electromagnetic radiation and absorbers take it in.

time arrow": particles that move not only from the past to the future, but also from the future to the past.

Vanini (2004) points out that this conundrum of what time reversal could mean is not restricted to physics but has implications for neurobiological understanding:

> *"This constant interaction between past and future creates a paradox which cannot be solved on the basis of time determinism. As Penrose has shown , the space-time description which is now emerging is incompatible with traditional concepts of causality and determinism. The fact that past and future causes coexist is named by King as "supercausality". In this model, King uses the concept of time inversion to describe brain structures. According to King, brain structures are constantly faced with bifurcations generated by the encounter of information coming from the past (diverging waves, causes) and information coming from the future (converging waves, attractors). In each moment, brain structures have to decide which path to follow, which bifurcation. According to King, free-will and learning are a result of this constant activity of choice, this constant indeterminism".* (Vanini, 2004, p97).

It is important to clarify a distinction between the idea of time reversibility and the idea of information propagated from the future. The intersection of causal and retro-causal influences does not imply 'winding the clock back'. It is far more subtle. In the classical and even quantum physics worlds, the mathematical physics is indifferent to time's arrow. You can call this the unwind wind-back view of matter, space and time. Smolin (2013) calls this the expulsion of time from physics. None of the above arguments deal with the quite different aspect on this implied in the concept of entropy.

The popular illustration of the irreversibility of the entropic process is an egg rolling off the edge of the table, splattering onto the floor. Except in a video recording played backwards, the splatter does not reconstitute itself and end up back on the table as a whole egg. This time experience is not reversible. So whatever the anti-time (equivalent to anti-matter) might be, it does not appear at the macro level of our experience. However, as research on brain structure has revealed, deeper than the structure of dendrites and synapses there is a network of microtubules which are so small that they operate at the quantum level. Penrose (1989) has used this fact to demolish the 'brain as computer' theory. It also suggests that the human system may be responsive to signals from the quantum level future. At the macro level the egg may not reconstitute but that does not necessarily rule out signals from the future having an impact on the behaviours of living organisms. Recent research on quantum biology (Ritz et al, 2000; Al-Khalili & McFadden, 2014) supports this possibility. Events at this quantum level do have consequences at the macro level.

Nevertheless time's arrow and the egg are real at the level of in our experience and, as Smolin (2013) argues, time is real. "*Evolving complexity means time. There has never been a static complex system. The big lesson is that our universe has a history, and it is a history of increasing complexity and time*." So we need to consider a view that enables both time's thermodynamic arrow and conditions beyond such linear time to be simultaneously present.

The relationship between time asymmetry and retro-causality will be investigated more fully when, in Chapter 10, we look more closely at life and anticipation.

Penrose (1989) is adamant that the second law of thermodynamics, hence entropy and hence time's arrow, is fully determined. Clearly the idea of syntropy[17] as opposite and complementary to entropy contradicts that position (Ludovivo, 2008). This is not the place for an in-depth cosmological discussion, but Penrose and Smolin are unconvincing as to how there could be sufficient order in the Big Bang that the universe has been running down-hill ever since then. Penrose escapes the ultimate and final heat death of the universe by proposing a circle of macro time wherein the death of the universe triggers the birth of a new one. For Penrose, life that appears to transgress entropy is simply a local phenomenon of an open system within an ultimately closed and therefore degrading universe.

Supporting the proposition of the present moment as a central concept in the exploration of what reframing the nature of the future, is one of Smolin's conclusions.

> *"The most radical suggestion arising from this direction of thought is the insistence on the reality of the present moment and, beyond that, the principle that all that is real is so in the present moment. To the extent that this is a fruitful idea, physics can no longer be understood as the search for a precisely identical mathematical double of the universe. That dream must now be seen as a metaphysical fantasy that may have inspired generations of theorists but is now blocking the path to further progress. Mathematics will continue to be a handmaiden to science, but she can no longer be queen,"* (Smolin, 2013).

As we will see in section 10.1, despite their formidable intellectual capability, cosmologists are largely embedded in first order science. My position is that time's arrow is real but open, agreeing with Smolin more than Penrose, and proposing that is not the only aspect of dimensionality in our experience and, since we are a sample of the universe, in the universe as a whole, which we will see is a view for second order science.

The link to second order science arises through the necessity of anticipation requiring signals from the future or feedforward. In a universe where time is absent then information from the future is meaningless. Equally to assume that future is simply a state of affairs which already exists on an extended time line is far too simplistic. Chapter 8 will frame this interpretation in a more rigorous way based on multi-dimensionality.

7.2 Deconstruction and Reconstruction of Dimensionality

All our experience is of what enters the present moment. So the idea of the present coming out of the future and going into the past, or of the future determined by the past driving through the present, would seem to be wrong habits of thought. Bennett (1956) addressed this

[17] Words with similar meaning to syntropy that crop up are negentropy, extropy, ectropy and or entaxy. I prefer syntropy because of its common root with synthesis and synergy

through a critique of our habits of thinking about dimensionality[18], especially those arising from the Cartesian legacy. More fundamental than the concept of dimensions, Bennett (1956) calls them 'determining conditions' to which every present moment conforms. It is these conditions that we interpret as dimensions, such as space and time. However, the content of the present moment is far richer or 'thicker' than only space and time. Einsteinian space-time is too constrained a framework for the richness of experience at the psychological and biological levels.

The boundary state of our present moment is not a closed affair. It is open to the unperceived in various ways. Some of the forms of openness are:

- from here to beyond-here, suggestive of space and separation
- to the established past by way of traces and memories, suggestive of time past
- to various degrees of expectation and desire, suggesting the future
- to the ordering influence of enduring forms, suggesting persistence in time
- to latent patterns that exert an organising influence, suggesting unrevealed potential
- to the livingness of the past, suggesting intensity of being
- towards its own creative scope and choice, suggesting renewal and transformation

The interplay of all the above factors renders the present moment not a calm bubble of awareness but a dynamic and turbulent arena of energy, action and meaning in which there is an unending conflict between the forces of order and disorder. Bennett (1966 p13) described this as the *war with time.* Time is a very real adversary. He sees order being created within the present moment (perpetual renewal) and disorder invading it from without (perpetual perishing). The outward tendency to lose order is associated with our experience of time, which relates to entropy and the second law of thermodynamics. However, a counter-balancing process to entropy is synergy, implying the powers of life, intelligence and purpose are engaged in a perpetual struggle to preserve, self-organise and create order within the present moment.

Di Corpo and Vanini (2011) report that Luigi Fantappie, the theoretical biologist, formulated the basis for syntropy:

> *"In 1942 the mathematician Luigi Fantappiè (1901-1955), while working on the mathematical properties of the energy/momentum/mass equation, found that the solution which moves forward in time describes energy that diverges from a past cause and matter which tends towards an homogeneous and random distribution, whereas the solution which moves backwards in time describes energy that converges towards a future cause and matter which tends towards forms of structure, organization and order. Fantappiè discovered that the solution that moves forward in time is governed by the law of entropy (from Greek en = divergent, tropos = trend), whereas the solution that moves backwards in time is governed by a symmetric law which Fantappiè named syntropy (from Greek syn = convergent, tropos =*

[18] Bennett et al (1949) worked on a five dimensional extension of Einstein's four dimensional space-time. He later extended this framing to six dimensions. The introduction of determining conditions as a terminology enabled a step back from the mathematical physics and link dimensionality closer to everyday human experience as well as unusual states of consciousness.

> *trend). Listing the mathematical properties of the law of syntropy, Fantappiè discovered that they coincide with those of living systems, thus reaching the suggestive hypothesis that life is caused by future causes and only marginally by past causes."* (Di Corpo & Vanini, 2011, p. 34).

Thus there are forces associated with time, entropy, probability and causality that perpetually break down order towards reducing the present moment to a random, unstructured chaos. Within the present moment there is a counter process establishing and maintaining a higher order here and now. This immediate present action is termed by Bennett *coalescence*. The notion that the embrace of a present moment is a function of coalescence could be linked to the notion that teleogenic systems are able to function through coherence. Coherence is the capacity to infer meaningful wholes, similar to the view of Parks and Steinberg (1993) that the representation of memory is a holographic function (the whole meaning is distributively encoded[19]). This could be the way in which memory traces are sustained in the present moment. "*The capability to recreate – at least in partial form – the totality of an experience from a partial description of the waveform suggests an efficient mechanism for filtering an appropriate signal from the variety of background noise."* (Parks & Steinberg, 1993, p259-264).

7.3 Stepping Beyond Simple Causality

From a strategic decision making perspective, our interest in the future is to anticipate it sufficiently to take advantage of opportunities and be better able to avoid threats. At this point an excursion into systems thinking related to anticipation and purpose throws some light on the underlying assumptions of the conventional view of linear time. Two views of systems are examined. Firstly the concept of anticipatory systems and secondly the notion of teleogenic or goal creating systems.

Rosen (1985) articulates the notion of anticipatory systems. He is intrigued by the incompatibility of living systems with classical causality:

> *"I was amazed by the amount of anticipatory behavior observed at all levels of the organization of living systems [...] systems that behave as true anticipatory systems, systems in which the present state changes according to future states, violate the law of classical causality according to which changes depend solely on past or present causes. We try to explain this behavior with theories and models that exclude any possibility of anticipation. Without exception, all the theories and biological models are classical in the sense that they only seek causes in the past or present."*

One way of describing anticipatory systems is that they have a modelling function which is able to carry out time path mapping faster than the unfolding of real-time (Louie, 2010, 2013). The

[19] This is illustrated by when a holographic photographic plate of a whole object is fragmented, each fragment, when illuminated, displays the whole abject (albeit with less definition).

impact of the output of this internal modelling on the behaviour of the system is not to be confused with feedback, which is information about deviation or error from a set norm. In contrast, information from anticipated future states is essentially a *feedforward* process. Anticipation implies deciding what to do now in terms of what is perceived to be the consequence of that action at some later time than the immediate now (Louie, 2010). Feed forward requires the system to have the capacity to model the world in such a way as to estimate future developments. This feedforward capability is also implicit in the Conant Ashby principle that any regulator of a viable system needs to incorporate a model of its own system and its environment. (Conant & Ashby, 1970; Clemson, 1984) However, as stated on page 52 the emergent nature of complexity may limit the applicability of such modelling explanations.

Poli (2010) points out that anticipation implies a shift in the paradigm of causality. Husserl (1917) describes anticipation as a component of the specious present (that is the time duration of one's perceptions) in which what is given is surrounded by a double halo comprising what has happened and what is going to happen. Bloch (1995) takes this further with the point that an ontological category makes sense only if the entities are categorically open, meaning that some of their aspects are still hidden and latent. The concept of latency or potential is a crucial component of the elaboration of the present moment later in this paper. Latency relates to the experience of perceiving potentiality for being. Poli (2010) also makes the distinction between explicit and implicit anticipation. Explicit anticipations are those of which the system is aware. Implicit anticipations work below the threshold of consciousness.

These considerations also occur in theoretical physics. Bohm (2010) considers views such as a time ordered series (one event after another) and space ordered separations (simple distance between objects) are inadequate as explanations of what is going on, especially at the quantum level:

> *"A new notion of order is involved here, which we call the implicate order (from the Latin root meaning 'to unfold' or 'to fold inward'). In terms of the implicate order one may say that everything is enfolded into everything. This contrasts with the order now dominant in physics in which things are unfolded in the sense that each thing lies only in its own particular region of space (and time) and outside the regions belonging to other things."* (Bohm, 2010, p85)

In this view the implicate order is latent or holographic in the present.

This way of looking at things enriches the conventional linearity of time's arrow. It does not eliminate it but implies that there are other things going on as well. But this does not go far enough. We need also to recognise that anticipation can have the capacity to be reflexive. This means not only looking into the future but also taking into account the consequences of that looking. In other words, to know I am anticipating already may affect my current behaviour and choices. (Poli 2010)

Anticipation also implies purpose. This is clear in human terms but, in terms of theoretical biology, is also a property of life. From a systems thinking perspective, Locker and Coulter (1975) attempted to conceptualise this aspect with the notion of teleogenic systems. There are three

definitions of system to consider. Firstly, a system which simply pursues a goal which has been set outside the system is called *teleonomic*. An example is a heat seeking missile. Secondly, a system which can select any from a set of goals which it then pursues is called *teleozetic*, meaning goal selecting. Thirdly, the system which can not only select and pursue goals but is endowed with the ability to generate new goals may be called *teleogenic*. Locker and Coulter associate this concept of the latter kind of system with the incorporation of an observer who is not passive but can actively engage in specifying goals for the observer-system. This echoes Vickers' (1968) notion of the appreciative system referred to in Chapter 4, p66.

The basic subsystems of a teleogenic system they propose include a forecaster, an evaluator, a director and an environmentally perceptive capacity. The director component has the capacity to generate new goals. This concept has proved difficult to incorporate into normal science, which eliminates any validity to purpose (science is traditionally against teleology). However, as we shall see, the intentions and motivations of agents concerned about the future are critical. We need to go beyond normal science to post-normal science in this domain. (Funtowicz and Ravetz, 1990, 2012)

Seligman et al (2013) have made a strong case that a representation of a yet-to-be-realised state and plays an essential role in intelligent relational behaviour.

> *"Such explanations are indeed teleological, but that is because nature contains purposeful or goal-oriented organisms, not because nature itself has purposes or goals. So there need be nothing illicit or contrary to the natural order about invoking representations of the future to explain behaviour in the here and now. On the contrary, as increasing knowledge of the brain reveals, explanations that leave out the teleological element in the guidance of action are inadequate."* (Seligman et al, 2013, p136).

They conclude that being driven by the past is as unsuitable as a framework for living as it is as a framework for theorising about the nature of life, especially sentience and psychological life.

Reflections on Chapter 7

It became inescapable that to formulate a new interpretation of systems science that can integrate with futures thinking, that the question of science itself should be addressed. Of course this is a massive undertaking that a single chapter cannot do justice to. It also risks high exposure to criticism from established science, which is averse to speculative exploration and inclined to be either defensive of the status quo or dismissive of anything before it has had a chance to evolve its own form of robustness. What I have attempted here is to open up the question and point out that both reputable and fringe scientists are questioning the rigidity of dominant assumptions. The history of scientific advance shows that each successive wave of new insight becomes the next restrictive dogma of the next stage of analysis.

The ambiguity of this frontier of science is well expressed by Faye (2002):

> *"How and whether the notion of backward causation has a role to play in physics has yet to be seen. But as long as no common agreement exists among philosophers and physicists*

> *about what in the physical description of the world correspond to our everyday notion of causation, it would still be a matter of theoretical dispute what counts as empirical examples of backward causation".* (Faye, 2002)

In my reflections I have come to the view that, although it is clearly and unavoidably important, the understanding of time and causality cannot be the domain of physics exclusively, especially since restricts it predominantly to first order science. Philosophers at least question many of the assumptions, recognising that experience must not be simply put to one side as subjective irrelevance. The original phenomenology of Husserl, though a useful perspective suffers from a paradox that it is concerned with experience but brackets out the real world (Mingers, 1992). I discussed this in Section 5.3.

It seems to me that only a transdisciplinary multi-perspective approach will reveal something of the degree to which any given disciplinary approach has a strong contribution to make but then is blinded to a more complete view by its own speciality. This goes for philosophy as well.

In this respect I am reminded of the often quoted parable of the blind men and the elephant. Each discipline grasps a part of the whole but then claims it is the whole. In this work I cannot claim to grasped the whole but I have tasked myself not to fall into the limiting perspective of just one discipline or claim closure on the understanding. As primarily a practitioner and secondarily a researcher, the benefit of this approach will be if it suggests some new and potentially more effective ways of dealing the complexity and uncertainty of global challenges we all face. I illustrate this direction in Chapter 16.

****

PART THREE – The Present Moment

Chapter 8: Being in the Present

8.1 Multiplicity in the Present

There are similarities in the cognitive challenges in both systems thinking and futures thinking. In the systems thinking field, Doyle (1997) makes a plea for a more scientific approach to research on the ability to do systems thinking.

> *"To a large degree the question of the ability of systems thinking interventions to produce desired changes in thought, behaviour, or organisational performance 'remains the province of anecdote rather than rigorous follow-up research' (Cavaleri and Sterman, 1997). Why are the anecdotes and observations collected by SD practitioners and educators, based on years or decades of experience and expertise, insufficient to demonstrate the efficacy of systems thinking? Because even experts tend to make poor casual observers or 'intuitive scientists' (Tversky and Kahneman, 1974)"* (Doyle, 1997, p254).

Midgley et al (2013) have reviewed this in the field of problem structuring methods (PSM) and also come to the conclusion that our methods of measurement and evaluation fall short and require much more research. The potential of theory-based evaluation methods is considered by White (2006) offer promise of going beyond the anecdotal.

An expression often used is that system behaviour can be counter-intuitive. This implies that on occasions an understanding of systems tends to go counter to people's usual mental models and schemas. It is part of the cognitive discipline of the systems intervener to hold interpretations in mind that are different from ingrained cognitive habits. This, of course, implies a capacity for self-questioning of one's own mental models and interpretations. Similar conditions apply to futures thinking. Imagination of possible futures in the face of uncertainly goes against the deep psychological grain that seeks certainty, both personally and professionally. The full acknowledgement of imagining in the face of not-knowing is counter cultural, just as deep systems thinking is counter intuitive. One of the possibilities for synthesis of these two fields could involve mutual enhancement and clarity about what needs to be different in the minds of the practitioners.

In the scenario field, Ogilvy (2011) has identified four stages of development in futures thinking: the cyclical ideas of the Greek philosophers and their inheritors; the emergence of the modern and progressive era, where forecasting and planning dominated; the third phase of uncertainty and post-modern methods including scenarios; and an emerging fourth stage which he says involves a 'scenaric stance'. By this he means the entertaining of multiple simultaneous scenarios of the future that may be contradictory (for example, pessimistic and optimistic) and leaving room for the unknown and the creative. Miller (2011) welcomes this step and reinforces it as a promising basis to develop an

ontology of the future, without which, futures studies are increasingly sterile in a complex, emergent and reflexive world.

It must be emphasised that the 'scenaric stance' is not the same as defining multiple (usually four) scenarios that is now widely practiced in scenario planning. It represents

> *"… a new approach to the future, a new attitude toward time. Neither ahistorical like the ancients, nor optimistic like progressive modernity, nor present mystic like the post-modernists, this new approach will hold in mind at once both the high road and the low road, and acknowledging the possibility of either, and giving full weight to human will in determining which path we actually take."* (Ogilvy, 2011, p.20-21).

This way of looking at the future requires us to rethink our capacity to embrace permanent ambiguity and to put our faith in acting in an anticipatory way in the present. It implies a recovery of a worldview enabling the creative openness of our experience. Miller sums up the implications of this: *"The perpetual ambiguity of Ogilvy's 'scenaric stance' calls on us to live the novelty that defines each instant of the re-assembling present*[20] *– at once inherently novel and closed – until the next moment".* (Miller, 2011, p30).

What these two authors have done, together with Poli (2010), is to establish the basis for a new ontology of the future. It is important to note several key notions that must be carried forward into any synthesis between systems thinking and futures thinking. These are:

- multiple futures, not necessarily compatible, held in the consciousness of the present
- openness in that consciousness to the presence of choice and creative action
- capacity of the mind to be firm in its embrace of this openness and complexity
- the implications of responsibility for choice in relation to the unfolding future

With these in mind we can tackle a more complex theory of the present moment.

Poli (2011) makes a distinction between the thin and the thick present moment. He supports the idea that the present can no longer be considered an instant that interfaces between the past and future, a knife edge between them. *"The idea is gaining acceptance that the present has both some duration and some depth – and therefore a rich multifarious complex series of structures."* (Poli, 2011, p71).

Bennett (1966) considerably enriches the notion of the present moment in his approach to a fresh understanding of history. As stated earlier, Bennett begins from reflection and examination of immediate experience; his starting point being that, in so far as we can have any direct perception and sure knowledge, this present moment is all that there is. Within this present he sees both perpetual perishing and perpetual renewal both requiring some explanation. The content of our present moment can be described as 'immediate mental objects'; which is, so to say, the 'furniture' of the present moment. However, we are also aware of a boundary to our awareness of content between the

[20] The term 'reassembling present' refers to the dynamic and even transformative possibilities within the present moment. Miller also refers to this as openness to a creative future rather than a predicted one.

perceived and the unperceived. Within the present moment we make inferences based on traces of what seems to be 'on the other side' of the boundary. We infer this through those immediate mental states we can call traces and expectations. Meaning, in the present moment, can be associated with the recognition of recurring patterns.

In Figure 8.1, the oval describes the scope of a given present moment. This represents a boundary between the perceived and the unperceived, which is indefinite or "fuzzy". The primary content of the present moment is its configurations of immediate mental objects. These comprise instant mental impressions, traces and memories, and expectations and hopes. The conventional interpretation of this content labels it 'present', 'past' and 'future'. But a number of other factors also characterise the present moment. It is not fixed in duration; it varies with our state of consciousness. Equally, the content varies as our experience shifts. We can describe the present moment as 'thin' when the duration or interval of time is small and the degree of content is small. On the other hand we can characterise it as 'thick' when we embrace the entire field of our concerns and do so through an expansion of our awareness range. In all of this we make interpretations of our experience, which are some combination of conscious and subconscious framing.

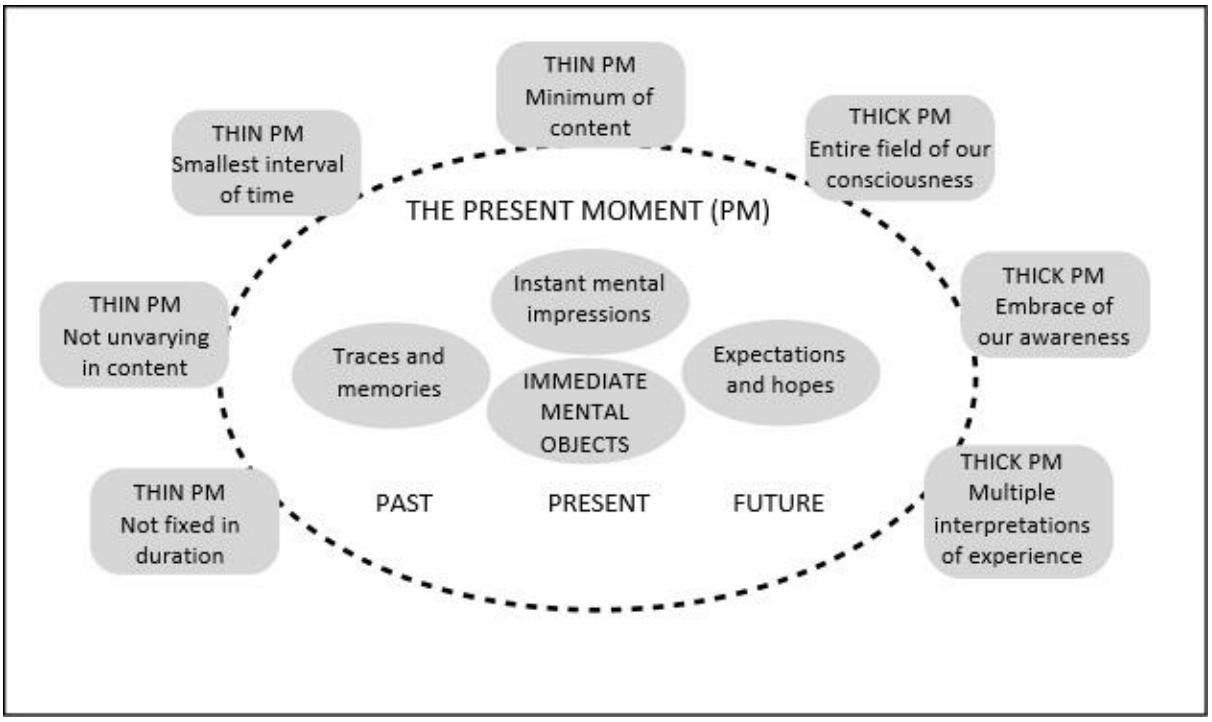


Figure 8.1– The experiential structure of the present moment as the embrace of our awareness.

8.2 Deepening Now

An ontology of the present moment needs to get beyond the simplistic division of time into past, present and future, and its failure to recognise that our actual experience is in some way tenseless. In his analysis of this from a philosophical perspective, Mozersky (2006) asserts that there are no elemental properties that are properties which make the distinction inherent, that distinguish past, present or future. He goes on to affirm that from the perspective of conscious experience there are two aspects we need to consider:

> *"First, the present is experientially privileged in that we are only ever capable of experiencing that which occurs in the present…. Secondly, as we interact with the world it appears as if time, in some non-metaphorical sense, passes; what was future becomes present and then passes"* (Mozersky, 2006, p 441).

Poli (2011) points out that a deeper and more comprehensive investigation of what we mean by the future leads to a much richer picture to be taken into account. He takes the view that

> *"The present is articulated along different dimensions. Some dimensions of the present include the actively remembered past and imagined futures. Other dimensions instead include natural and social rhythms, both visible and latent. We have seen that the first tentative steps taken towards ontology by introducing dispositions had to be supplemented by the more articulated theories of anticipation and latents. The net consequence of all this is that one cannot escape from ontology."* (Poli, 2011, p75).

The question that here needs examining is how far the past-present-future distinction can be contained within the present moment. The proposition is that an event which is "immediately passed" (not long gone) is still apprehended and therefore is not simply memory, and how an event coming-to-be is now apprehended is not simply a prediction of a causal consequence. This question leads into consideration of what we can call the *thick present moment* (Poli 2011). A step in the re-framing at this point is to propose that the apprehension of time as duration is not built up from awareness of succession, but rather awareness of succession derives from a prior awareness of a "whole" or duration of time already experienced. The present moment is taken here to have a variable dynamic content. High content present moments can be referred to as ‘thick’ and low content ones as ‘thin’. This content can have generative power that creates further present moments such that a simple linear causation through time or the unfolding of an otherwise timeless universe, are inadequate explanations. In the world of quantum physics Smolin (2013) proposes a mathematical model of causation of a thick present, called energetic causal sets, such that each moment may be the parent of future events. A thick present moment has not spent its capability to parent new events.

What is the relationship between the experience of the present moment and the notion of an implicate order (Bohm 1980, Chapter 6). According to Bohm we can suppose there is order in the universe which differs from simply an arrangement of objects or events; This type of order is contained in some implicit sense, in each domain of space and time. The word ‘implicate’ means to

fold inward. Thus a total structure is enfolded in this domain. This defines the implicate order. My proposition is that since this ordered structure is present in both space and time then it is reasonable to suppose that each present moment has its own implicate order.

If we assume also that memory in the present moment is holographic, then this is also consistent with Bohm's (2003) notion of the fundamental *holomovement* of the implicate to the explicate order:

> *"The movement of enfoldment and unfoldment is universal, while the extended and separate forms that we commonly see in experience are a relatively stable and independent pattern, maintained by a constant underlying movement of enfoldment and unfoldment. This latter I called the holomovement."* (Bohm, 2003, p85).

The implication here is that the strength, embrace and coherence of our present moment is analogous to a holographic phenomenon.

A deeper exploration of the present moment must begin from acknowledging that it is a property of a self, a subjective experience. It is reflexive and second order in its character. The present moment is where we live, and in so far as we can have any direct perception and sure knowledge, this present moment is all that there is. In second order cybernetics the observer and observation are inseparable and the act of observation is in someone's present moment. It is constantly changing, a state of "perpetual perishing" which we interpret as time. However, observation of our experience shows that it is also in a state of perpetual renewal, sustaining the here and now. Its variations for each one of us are a function of our own consciousness in the present. Bennett (1966) puts it this way:

> *"The extent and coherence of the present moment are evidently connected with the embrace of our awareness. We can say the present moment of each one of us is relative to the integrative power of our own will. For subjective idealism, the present moment is nothing but the content of the mind. For objective materialism, the mind is nothing but the context of the present moment. The two viewpoints are contradictory only if we import artificial distinctions of past, present and future, or here and now, there or elsewhere, into our interpretations of experience."* (Bennett, 1996, p14).

The key component of the above quotation is 'embrace of our awareness'. We are not used to thinking of structured wholes being an aspect of consciousness that is beyond the subject/object distinction and beyond the realist/ idealist dichotomy. Present moment implicate order offers this alternative. A disjunction between our experience of the present moment and the whole interpretive edifice that we have constructed around time, stasis and change reveals the subjectivity of objectivity.

Maturana (1995) asserts the view that we live a continuous present and that, as observers, we invent past, present and futures to give an account of now. This is a function of our being 'languaging' creatures:

> *"We live our existing in language as if language was a symbolic system for referring to entities of different kinds that exist independently from what we do, and we treat even ourselves as if we existed outside language as independent entities that use language. Time, matter, energy, …would be some of those entities."* (Maturana, 1995, p2).

In this sense the present moment can itself be considered a way of languaging our reflections on being present in our living state and as an aspect of the continuous process of creating ourselves as autopoietic beings (Boyd 2010). But there is a catch here.

The intellectual constructs we make regarding space, time and future were sharply distinguished from the phenomena of our experience by Bergson. Duration, for Bergson (1910), is continuity of progress and heterogeneity, which implies a conservation of the past. Memory conserves the past and this conservation does not imply that one experiences the same (re-cognition), but difference. One moment is subsumed into the old ones. The past is 'larger' for the current moment than it was for the previous moment because we are talking here about retentions of retentions, the former containing, and therefore being 'larger' than, the latter.

> *"We can thus conceive of succession without distinction, and think of it as a mutual penetration, and interconnection and organisation of elements, each one of which represents the whole, and cannot be distinguished or isolated from it except by abstract thought. Such is the account of duration which would be given by a being who was ever the same and never-changing and with no idea of space but familiar with the latter idea and indeed beset by it, we introduce it unwittingly into our feeling of pure succession; we set our states of consciousness side-by-side in such ways to perceive them simultaneously no longer in one another but alongside one another. In a word we project time into space; we express duration in terms of extensity, and succession thus takes the form of a continuous line or chain, the parts of which touch without penetrating one another."* (Bergson, 1910, p101)

The intuitive step from here is to incorporate the future into the wholeness of the duration together with aspects of pattern and quality or intensity of will. The duration is open to include, not just the past influencing the future, but also futures influencing the past. The above descriptions of the present moment might be considered to be a version of *presentism* (Mozersky, 2011). This is a doctrine that everything is present and only that which is present exists. This, however, is cast in a first-order set of assumptions. The view of the present moment described in my approach is second order. There are different present moments with different spans of presence which can be nested within each other but all contained in what Bohm referred to as a 'qualitative infinity' in an undivided universe. The meaning of existence in presentism is not sufficient. Mozersky points out that what exists in the present is not sufficient to underwrite all the apparent truths concerning the past and the future.

Clearly, this way of looking at time and experience is different from our customary one and challenges us to perceive in a different way to usual; or, in a word, to *reperceive*. Wack (1985) emphasises the importance of reperception in evaluating whether a scenario exercise had contributed to improving the decision making of executives. De Geus (1988) develops this idea to treat decision making as learning. When *Planning as Learning* (de Geus, 1988) was published, there was a period of intense debate in Shell as to whether learning (which surely includes reperception) has anything to do with decision making.

"In those days, there was a lot of scepticism whether the verb "to learn" was applicable to the decision making process at high levels of complex and sophisticated organisations like Shell. The article attracted a lot of attention, and not only internally in the Shell Group. Several translations and elaborations were published in the ensuing years." (de Geus, 1992) [21]

Considering decision making as learning is a key aspect of my synthesis of systems and futures.

8.3 Decision Making as Reflexive Learning

Examining the nature of decision making as learning is strengthened by considering the decision system in the context of cybernetics. The decision system as I have defined it here is threefold cybernetic system which relates (Figure 8.2)

a) a decision field – which is the bounded area of concern of the decision maker
b) the decision process – which is the (often structured) method used to arrive at a decision
c) decision integrity – which is the second-order stance taken by the decision maker relating to ethics and values as well as standards

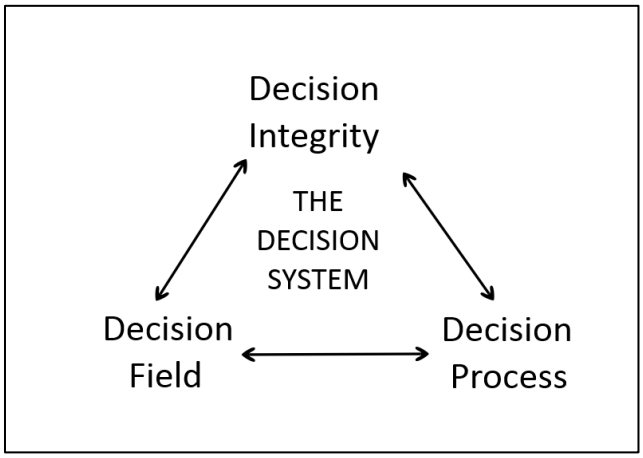


Figure 8.2 The Decision System (adapted from Hodgson, 2010)

Particularly relevant is the role of Ashby's Law of Requisite Variety (Ashby, 1960) in a guidance system.[22] Let us suppose that the decision system has a primary goal. It might be to make money, to heal the sick or to win a team game. The decision field has a quasi-infinite set of states or variables, only some of which can be known and predicted. We have established the mismatch between the decision process and the decision field. Ashby's Law states in effect that the greater the variety of the context then the greater the need for variety in the guidance system. Stafford Beer

[21] http://www.ariedegeus.com/thinking/learning-as-the-essence-of-decision-taking-processes/

[22] See also Section 3.2 where Ashby's Law was described.

summarised this as 'variety absorbs variety.' This implies that the higher the variety (complexity) of the decision system, the larger the range of perturbations that can be accommodated or compensated. It leads to the somewhat counter intuitive observation that the decision system (individual or group) must have a sufficiently large variety of options in order to ensure a sufficiently small variety of outcomes in achieving the goal. This principle has important implications for practical situations: since the variety of perturbations a system can potentially be confronted with is extensive and unknown, we should always try to increase its internal variety (or diversity), so as to be well prepared for any foreseeable or unforeseeable contingency; hence the importance of continuous learning. This is also a condition for resilience (Fazey, 2010).

A confusion can be made as to the distinction between the first order and the second order meaning of variety. A first-order approach would regard variety (i.e. the number of possible states of a system) as an inherent property of the system in itself. It its original form Ashby saw variety as arising from the engagement of the observer. For example, I have used this in considering the variety of my transdisciplinary world systems model (Hodgson, 2012). From a second order perspective it might be argued that the concept of variety as an objective state of the system disintegrates because all variety is in some way perceived. But I propose, drawing on Bhaskar's (1988, 2011; and Section 5.3) notion of transcendental realism, that just because variety is observer perceived does not mean that that it does not in some sense exist. I think it is important here to stick with the notion that 1st order science is not excluded from second order science but is contained within it as a special case where the intersubjective consensus is extended to the point where it seems to disappear where actually it is subsumed into a particular paradigm of science (Kuhn, 1962).

This challenge of linking the decision field to the actual mental frame of the decision maker was clear to Pierre Wack, a key originator of scenario thinking. In making his final critique to Shell executives and planners of the state of strategic planning, and especially the use of scenarios, he strongly affirmed the point that unless the decision maker himself or herself actually changes in the process of arriving at a choice, then the exercise is useless. He names this needed shift "the gentle art of reperception" (Wack 1985). The shift in perception of the decision makers is an essential component of the decision system for scenario planning to be successful. The decision maker needed to enact his or her intentions as a mental rehearsal in the context of the scenarios. To explore this further we need to consider how the interaction between decider and decision field can lead to shifts in the nature of strategies and decisions.

My experience of helping executive and planning teams both to develop multiple scenario thinking and to frame strategy work to match process to external challenges has led me to propose that the frame of decision making needs to move from decision maker as detached observer, through involved observation to self-aware involvement. In other words, to move from the classical scientific paradigm, through systems science to the emerging domain of second order cybernetics and the

emerging understandings of embedded cognition, to a new resonance between the global decision field and the practiced decision processes. I call this third stage of correlation, *decision integrity*.

What is a decision emerging from reperception? We must first distinguish between those kinds of decision which it is possible to delegate to constructed systems (such as computer programmes, artificial intelligence and automated decision support) and those requiring the specific insights of human beings. Von Foerster (1995) sums it up this way "*With the essence of observing, namely the processes of cognition, being removed, the observer is reduced to a copying machine, and the notion of responsibility has been successfully juggled away."*(von Foerster,1995, p9). In an age where more and more decisions are delegated to automated systems (which can often perform better than most human beings at some tasks), why are humans other than a temporary expedient only needed until all significant decisions can be delegated (Kurtzweil, 1990)? The necessity for the human being in decision making arises where there is a need for *integrity*. Integrity has several aspects to it. It implies *integration*, in the sense of taking into account a whole picture in which the decision is framed in a wider context than that of the immediate concern. For example, regarding the long term implications, not just the short term payoff. Also taken into account is *the spatial and structural context of interconnections, linkages and feedbacks*. So integrity implies the *big when* and the *big where*.

Integrity also involves an *ethical* dimension: a sensitivity to values, and a degree of consistency in relation to those values that transcends optimising and satisficing (Simon, 1996). In a complex world these two sides of integrity, the holistic and the ethical, are often incompatible. In a system where economics is dominant, the ethical is considered secondary and even itself "unethical" by viewpoints such as the Chicago school, who assert that there is only one social responsibility of business – to use its resources to engage only in activities designed to increase its profits (Friedman, 1979).

Another approach to decision making under uncertainty is that of risk mitigation. When faced with a set of uncertainties which cover a range of future states, some of which are unfavourable, then the uncertainties constitute a hazard. When we form an intent to act within that hazardous situation we are faced with a risk. The manner in which we deal with that risk will challenge us with an ethical dilemma. In a situation where the risk frame is more complex than a simple good/bad choice, and the ethical frame is more complex than a simple right/wrong choice, then we are faced with a need for decision integrity. This is especially so when emergent circumstances present us with incalculable issues and destroy the rule book's validity requiring the exercise of decision integrity.

The discussion so far would lead us to believe that, as long as we can learn enough, we can decide. But given the gap between the high variety of the decision field and the restricted variety of the decision system, there are inevitably questions which are not decidable by those rules and

assumptions that imply von Foerster's (1995) 'copying machine'. This again leads us from first order to second order cybernetics.

In the first order mode, however intelligently and thoroughly carried out, the mental model of the decision maker is not treated as part of the system in question. It stands outside of it in the "observer distinct from the observed" mode. It is first order. Von Foerster (1995) points out that it took some time in the early days of cybernetics for the idea that there is a limitation to the classical scientific paradigm in which the observer is separated from the observed. This paradigm has tended to dominate management science and decision analysis. The implication in management is that the properties of the decision maker shall not enter the analysis of the decision space. Breaking out of this paradigm to the view that the observer has to give an account of him or herself in the system in question, creates a whole new perspective. He points out that "this *perception represents a fundamental change not only in the way we conduct science, but also how we perceive of teaching, of learning, of the therapeutic process, of organisational management, and so on and so forth…"* (von Foerster, 1995, p4).

From this perspective the decision maker is a participant in the world about which and within which decisions are being made. Without this recognition, integrity flees decision making.

Now, von Foerster goes on to make a profound but simple observation that relates back to the introductory remarks about decision integrity. In the first order paradigm, decision analysis is considered independent of the analyst and so can be informed by the rules of analysis as to what the "optimum" decision is. Any non-quantitative judgement is based on an explicit or implicit moral code. By contrast, in the second order paradigm the decision maker is considered part of the system under decision and so can only tell himself or herself what the "best" decision is. This, von Foerster (1995) points out, is the origin of ethics and that ethics cannot be articulated as a code (contrary to the desires of some business ethics practitioners). The validity of ethical action lie in the action itself.

In the paradigm where the decision maker is viewed as independent of the decision field, as in the mode of classical science, then the aim of decision framing and analysis is to render decidable whatever question is being asked. Von Foerster (1995) also points out that, as well as this type of question, there are other kinds of question that are in principle *undecidable*. Whether we recognise such questions and how we treat them if we do, is the crux of the matter.

This brings us to need to consider the mental model of the decision maker, and indeed for him or her to consider reflectively his or her own mental model. Clemson's (1984) treatment of management cybernetics is helpful in representing the basis of this issue. In his discussion of the operational unit in the context of Beer's viable systems model (VSM) he describes a set of relationships as shown in Figure 8.3.

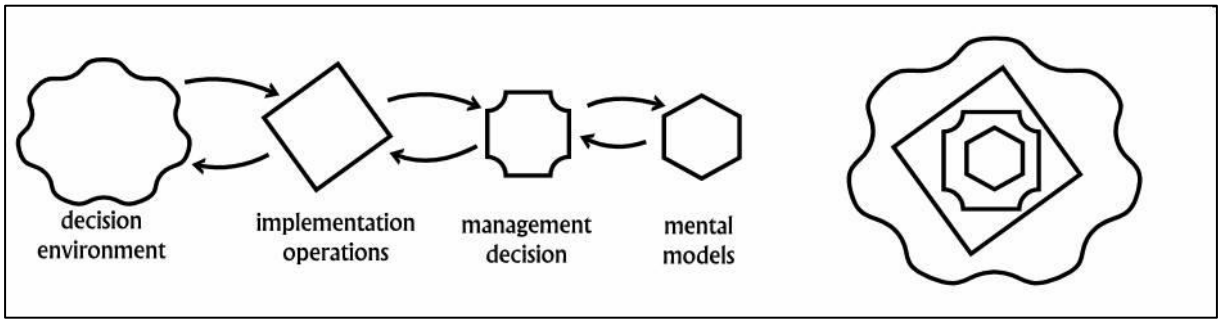


Figure 8.3 An Operational Unit in Viable Systems- Extended and Nested Nature of the Levels (adapted from Clemson, 1984, p102)

Modified for decision making, the *decision environment* is the contextual field in which the decision is taken. This is also the high variety, unpredictable and unruly world upon which we impose our scientific or rational order. Within that environment, and of considerably less variety, is the *implementation operation* which is the vehicle of the decision. It could be an organisation or a project. It has a reciprocal relationship with the environment, acting upon it and being acted upon. This, in turn, is subject to a *management decision* that is an intervention by the decision maker. He or she is steering the ship, so to speak, also with a two way interaction based on a *mental model*. Interventions are of even less variety than the operations themselves and the feedback from the operations is highly filtered information. The variety of the decision system is less than that of the decided upon operation. The decision maker's approach to the steering action is therefore framed by the mental model of the decision maker, represented in Figure 8.2 as the hexagon. In other words, how they view the world is a determinant of the interventions made. This is also a two way relationship between viewpoints and interventions which may be in stasis, that is holding to some pattern of adjustment to change, or dynamic, that is shifting the pattern upon which guidance is based.. In the static mode, equivalent to Argyris's (1990) single loop learning, the main interaction between the mental model and the management intervention is error correction. In the dynamic mode, equivalent of Argyris's (1990) double loop learning, the interaction is assumption revision implying an enrichment of the mental model. At either level, the mental model is being enacted in its engagement with the decision field.

The mental model of the decision maker may be more or less sophisticated. It may be very complicated but still linear. It may be informed by systems thinking and cybernetics and enriched with dynamic loops. In this case we could say that the decision system of manager-operation-environment is working in a frame of first order cybernetics. This offers some movement towards decision integrity in a complex interconnected world.

We can make a step towards the second order perspective if we realise that the different components in the above diagram are actually embedded in each other (beer, 1979). In other words, the mental model is embedded in the decision maker is embedded in the operation is embedded in the

environment as shown in Figure 8.2. Thus we can see that the decider is actually part of the decision environment or decision field. The decision maker then is exercising a cognitive system which is distinct from his or her history of action in the decision field, but reciprocally influenced by it. However, disconnection can occur also. Crucial signals are filtered out by habit or prejudice and open up a mis-match between the mental model and the behaviour of the decision field. To be corrected this needs a step from single loop learning to double loop learning. (Argyris et al, 1985)

This perspective has much in common with the view that cognition is enactive. In the enactive view, representation is taken to be separated from action, whether the realism of construction of a mental model from external information or the idealism as the projection of a pre-given inner world. Varela, Thompson and Rosch (1991) consider the real situation to be a "middle way" between these two opposites. They state that we can

> *"…situate cognition as embodied action within the context of evolution as natural drift provides a view of cognitive capacities as inextricably linked histories that are lived, much like paths that exist only as they are laid down in walking. Consequently cognition is no longer seen as problem solving on the basis of representations; instead cognition in its most encompassing sense consists of the enactment or bringing forth of a world by a viable history of structural coupling."* (Varela et al, 1991, p. 205).

From the perspective of both second order cybernetics and enactive cognition, the separation of decider from decision field is a misleading construct. They are inseparably bound together and the pathway taken by the decider is reciprocally bound up with the decision field and the outcome of any decision.

The key in this chapter and what follows in Chapter 9 is the essential relationship between transformation and change of pattern. We can define transformation as the deconstruction of a given pattern **A**, with properties ***a***, and the reconstruction of a quite distinct pattern **B**, with properties ***b***. The intermediate transition stage is of a different character since it is the turbulence zone in which, and through which, the shift of pattern from a to b takes place.[23]

Since its introduction by Kuhn (1962) in his work on the nature of scientific revolutions, the word paradigm has entered the language as a rather loose and generic term for some kind of change of practice and belief in the community or society. Kuhn himself reflected on the looseness in the use of the word and attempted to tighten the meaning up again. To understand this more clearly we need to clarify the more rigorous way we are using this term. Kuhn himself became concerned in recovering this rigour after the term had become popularised.

> *"I might now adopt the notation "paradigm" but less confusion will result if I instead replace it with the phrase "disciplinary matrix"--"disciplinary" because it is the common*

[23] This transition and transformation between patterns is considered more fully in Chapter 15 in the section on the 'three horizons'.

> *possession of the practitioners of a professional discipline and "matrix" because it is composed of ordered elements of various sorts, each requiring further specification. "*
> (Kuhn, (n.d.), p3)

Kuhn's emphasis here is on the way that a paradigm is configured by a shared discipline amongst a community of scientists. His use of the term 'matrix' points to the complexity in the nature of paradigms which, for example in science, covers a variety of dimensions and suppositions of the discipline. This notion can be extended to cover an entire society, even an entire civilisation and, in the case of sustainability, ideas about the entire social-ecological planetary system. To take this larger perspective it is useful to underpin this idea of paradigms with the analysis of Edgar Morin.

Morin (1999) defines paradigms as *"the promotion/selection of master concepts of intelligibility"* p8. For example, in a deterministic paradigm, a master concept is order; in a complexity paradigm a master concept is emergence. He points out that these master concepts organise the selection of ideas to be integrated into any worldview, and also what is to be refused and rejected. For example, in a Modernist economic paradigm, growth is to be accepted and non-growth is to be rejected as stagnation and failure. But in a systems paradigm, infinite growth in a limited habitat is rejected, and what is accepted is some notion of dynamic equilibrium.

Further, Morin points out that the paradigm also determines what he calls the "master logical operations", which implies that any paradigm sets out an acceptable form of rationality. 'Rationality' derived from another paradigm is considered irrational and inadmissible.

From this perspective we acknowledge that the whole of the above cybernetic structure is itself enclosed in a meta-mental model which might be considered as the world-view of the decider. The cybernetic structure described and the meta-model or world view are generally implicit or subconscious. From a reflexive view, however, they can be related to time consciousness through the notions of the present moment. This idea is developed in the next Chapter.

Reflections Chapter 8

What I am attempting to do here is to explore components of a fresh paradigm within which to integrate systems and futures thinking. A key to this for me is to break loose from taken-for-granted assumptions about time and pattern.

The notion of the present moment is proposed as a way of 'having our cake and eating it' in the matter of whether time is real or not. The multi-dimensional present moment accommodates that aspect of time perception which is constantly moving, as we often describe it, from the future into the present and into the past. It also accommodates the linear time of standard causality – that events now have been brought about by events in the past and will cause events in the future. However, the multi-dimensionality of the present moment also accommodates the timeless nature of latency, the 'not yet' and potentiality. Further it also leaves room for the presence of contingency experienced as hazard

and risk. The latter is important and is illustrated in the well-used metaphor of "how many acorns does it take to make an oak tree?"

A paradigm designates the fundamental categories of intelligibility as indicated by Morin and controls their use. Individuals are conditioned how to know, think and act according to these interiorised culturally inscribed paradigms. In other words, the paradigm has a strong emotional and subconscious power that holds people to a dominant belief system.

> *"The paradigm is both underground and sovereign in all series, doctrines, and ideologies. The paradigm is unconscious but it irrigates and controls conscious thought, making it also super-conscious. In short, the paradigm institutes primordial relations that form axioms, determine concepts, command discourse and/or theories. It organises their organisation and generates their generation or regeneration."* (Morin, 1999, p9).

In my struggles to find ways of integrating systems thinking and futures thinking I increasingly experienced a surfacing in myself of some of these powerful taken-for-granted ways of interpreting my reality which also exposed this feature in discussions in the various fields I have touched upon. In effect, I went through various stages of reperception in my research. This was more than simply finding and juxtaposing ideas new to me, whether from reading or my own thoughts. It is essentially an emotional, and even a physical, experience. It feels as if a paradigm or worldview is embedded in our whole neurobiological system, not simply 'in our heads'. In Chapter 9 I will explore the process of reperception (Wack, 1985) from three perspectives, induction, enaction and creativity.

In the context of the operation of ideological paradigms, reperception can be very powerful in helping people to become more conscious of the deeper assumptions that are affecting and inadvertently controlling their view of both the present and the future. Any cultivation of future consciousness that does not include some way of eliciting recognition of paradigm conditioning and assumptions is going to be, in effect, restricted to the current dominant paradigm. We need new kinds of dialogue and enquiry which help to surface these kinds of restrictive assumptions or deeply ingrained conflicts of viewpoint and bring them into a multi-perspectival shared space.

****

Chapter 9: The Challenge of Reperception

9.1 Reperception as Induction

Some of the ways in which changes of mind and worldview can take place range from the very pragmatic approaches of leaders in the field of scenario thinking and foresight, based on experience (Sharpe and van der Heijden, 2007), to the conceptual approaches of complexity scientists and psychologists to understanding the nature of induction (Holland et al, 1986). Some relevant findings from recent synthesis interpretations of neuroscience (McGilchrist, 2009) are also relevant to the problem. The combination of all these factors indicates that human and biological systems have the capacity to anticipate future conditions and can therefore be called 'anticipatory systems' (Rosen, 1985).

Burt (2010) distils from Wack's (1982, 1985) work what he calls three principles that determine the future, also referred to as pre-determined elements. The first is the 'macroscope' – the wider, complex, inter-connected system in which the organisation exists. The second is the identification of inter-related actions – driving forces that generate systemically inevitable events. The third is changing mindset. He describes this mental shift as follows:

> *"The purpose of the first two principles is the development of new understanding of the business environment that leads to change in managerial mindsets. If no impact arose from scenario planning then management would continue in their business-as-usual ways. The implication being that business plans would be underpinned by yesterday's (unreliable) assumptions. However Wack (and others) recognised that there were significant barriers to overcome. Barriers such as: managerial recipes and industry recipes. Recipes are professional knowledge based on common experience from which a set of beliefs and some rules of thumb are developed. Over time they become habitualized and institutionalized. Once institutionalized these recipes guide managerial thinking and acting by determining (and limiting) 'what is for us' and 'what is not for us'."* (Burt, 2010, p1478).

The decision maker requiring a change of mindset is actually more complex than just an observer. To take a decision is to commit to some interaction with the field of the decision and bring forth or lead to manifestation of a world. An investment decision places financial resources at the disposal of the situation that the decision maker has been observing and analysing. From a systemic point of view, the decision maker is an integral component of the decision systems he or she works within (Umpleby, 2007).

From a systems perspective, identifying hitherto unrecognised predetermined elements and generating and visions of alternative futures to embrace uncertainty is anticipation. The normal ways of monitoring performance in an organisation, or even a society, are based on feedback generated from the measurement of things which have already happened. In that sense, decisions are being guided by information from the past. Systemic foresight, in my view, can only be carried out properly in an *anticipatory* manner.

Rosen (1985) makes the point that, in an anticipatory system, there needs to be a feedforward loop which incorporates some view of the future which is not entirely derived from the past. We need to understand both feedback and feedforward in terms of cognition and induction. To do this we need to take a second order, reflexive view of the decision maker.

With regard to cognition as feedback, we appear to be dealing with the world in a way where its behaviour matches our expectations, so we codify and categorise the elements of the world. This correspondence is called by Holland et al (1986) 'homomorphism'. A homomorphism differs from an isomorphism, which would require two situations to have equal variety in their equivalent structures. A homomorphism is more of a pragmatic approximation. (Figure 9.1) We can link this to the first order view of the world where the homomorphism of a mental model or schema involves the taken-for-granted assumption that we are the detached observer seeing the world as it really is. If nothing major contradicts this then we apply our categories and rules; and so we are in the world of single loop learning, where deviations are treated as errors to be corrected rather than challenges to the deeper assumptions ingrained in the mental model.

The cognitive system can be viewed as a holarchy (Koestler, 1967). The most general level is H_0; within this are sub-holons H_1, H_2, and so on; and within any of these are further sub-levels $H_{1.1}$, $H_{2.1}$ and so on. H_0 establishes a general homomorphism based on a set of categories limited by rules and patterns. If these are in correspondence, they are able to predict future states of the environment or decision field. However, significant anomalies provoke new categories and rules that expand the predictive capability of the cognitive system. For example, a falling leaf, classified as 'airborne' is observed to move from flower to flower and is re-categorised as a "self-propelling" butterfly. In this way the variety of the cognitive system is expanded. This is a normal sense making activity.

The process of induction is represented diagrammatically in Figure 9.1. One of the crucial factors in reperception in scenario work is the entertaining of anomalies compared to business-as-usual rather than their exclusion through such attitudes as 'it's not possible' or 'it couldn't happen to us'. Anomaly is one way in which anticipatory information from the future is perceived. In my experience as a facilitator the degree of shock delivered by the anomaly is critical. If it is too low, then it is subsumed in the current mental model. If it is too great then it leads to denial, rejection or even fixation in a blind spot. The best opportunity for reperception is where the Phase 1 shock factor is intense enough to move the mind to Phase 2 and provoke a temporary crisis of "parallel competing homomorphisms" which then resolves into a Phase 3 reconfiguration of the holarchy. When the impact of the anomalous factor is at its optimum, Holland et al (1986) call this "the requirement for gracefulness" (p78) which in facilitation terms is *graceful entry* , which is related to the degree to which the decision maker or learner admits uncertainty and is willing to entertain alternate views, shown in Figure 9.1. *"The property of gracefulness is vital for inductive systems that are to operate in realistic, complex environments."* (Holland et al, 1986, p78).

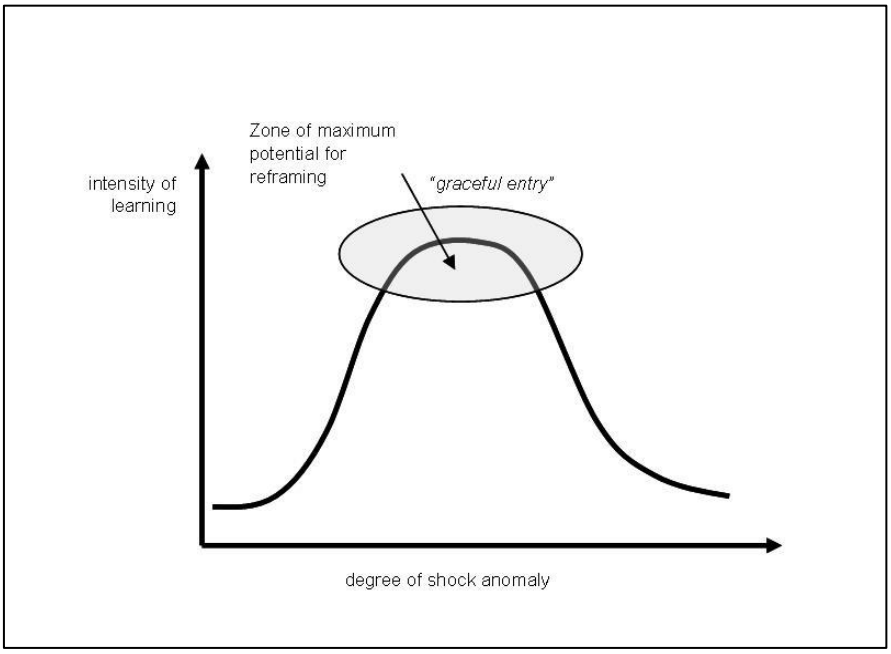


Figure 9.1 Graceful Entry

This gracefulness dovetails well with Wack's (1985) use of the word 'gentle' in 'gentle art of reperceiving'. The critical factor in moving from Phase 2 to Phase 3 is the extent to which the decision maker is willing to play with possibilities. In using a scenario method, one of the most crucial steps is to get the subjects to entertain the scenarios, however unbelievable, and play with them as if they were real. This discovery became central to the work of de Geus (1988) in his efforts to change the paradigm of decision making to incorporate the role of reperception in the organisational learning. He and his colleagues adopted the idea developed at the Tavistock Institute of 'transitional object', first introduced by Winnicott (1969) in his research on learning in children:

> *"One characteristic of play, as the Tavistock Institute in London has shown, is the presence of a transitional object. For the person playing, the transitional object is a representation of the real world. A child who is playing with a doll learns a great deal about the real world at a very fast pace."* (Winnicott, 1969, p 5).

The important distinction here is that, in the face of uncertainty, there are multiple representations of a possible reality that have not yet happened. The uncertainties have not yet been resolved by subsequent events.

As an example, a good scenario set builds up in the mind of the decision maker at least two competing 'memories of the future' (Ingvar, 1985). What usually happens is that a trial sub-holon H_1 that might fit with the new realities detaches from the homomorphism H_0 and becomes a parallel, competing cognitive orientation. As the option of continuing 'business as usual' becomes increasingly implausible through considering the scenario implications and the gathering of more indicative evidence, a flip occurs and H_1 becomes the new top level, or inclusive homomorphism $H_{00,}$ with H_0 becoming a sub-holon. This is illustrated in Figure 9.2.

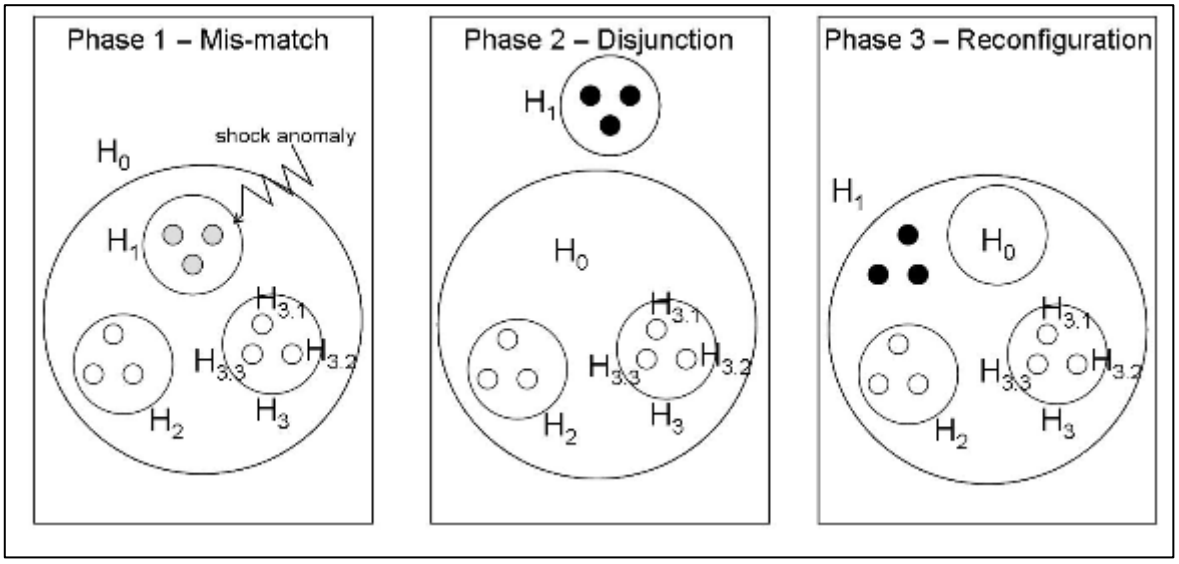


Figure 9.2` Three phases of reperception as induction

The important distinction here is that, in the face of uncertainty, there are multiple representations of a possible reality that have not yet happened. The uncertainties have not yet been resolved by subsequent events. Exploring these multiple representations is one way a system can become anticipatory.

Holland et al. (1986), in their study of induction, have gone some way to explaining why there are strong barriers to engaging in the kind of learning, or reperception, required to make decisions under conditions of uncertainty. Returning briefly to the Clemson (1984) diagram in Figure 8.2, we note that the triangle represents the mental model of the decision maker. This mental model is a short hand for the cognitive patterning of the decision maker. Holland et al's approach has similarities to the theory of embedded cognition[24] in that the emphasis is on the transactions between the learner and the environment. We encounter the world through transactions between our mental models and the behaviour of the world. When we improve our effectiveness in the world we have made a step of improved correspondence between the mental model and the world. In a quasi-infinitely complex environment, the extent of this correspondence is limited by the law of requisite variety which states that the variety in a control function must match that of the environment under control. For effective decisions, there ideally needs to be a sufficient degree of structural equivalence between the mental model and the decision field.

To recapitulate, where we appear to be dealing with the world in a way where its behaviour matches our expectations, we codify and categorise the elements of the world as a homomorphism. In

[24] See Section 9.3 for an account of embedded cognition.

that sense a homomorphism is a pragmatic approximation. We can link this to the first order view of the world where the homomorphism of the mental model becomes the subconscious assumption that we are the detached observer seeing the world as it really is. If nothing major contradicts this then we apply our categories and rules and so are in the world of single loop learning where deviations are treated as errors to be corrected rather than challenges to the deeper assumptions ingrained in the mental model.

The higher the uncertainty, the higher the level of challenge that comes to the decision maker in the form of the observation that "in spite of adjustments, things still don't make sense". New situations require new cognitive rules of interpretation. New rules can be considered in the context of decision making as "options in waiting".

> *"New rules get a chance, typically, in situations where none of the high-strength rules have their conditions satisfied. That is, new rules are tried in situations where the system does not know what to do. The generation of new rules is triggered by just such situations for just this purpose. The new rules fill new "niches" corresponding to domains in which the system has inadequate sets of rules, as revealed by its inability to make reliable predictions."* (Holland et al., 1986, p79).

9.2 Reperception as Creativity

The brain is an amazing patterning device. From limited information it synthesises the world as we know it. What we take to be presented reality is constructed, and we project our constructions onto the world of sense perception. Once a pattern is developed in the brain it is difficult to change because any new incoming information tends to be interpreted according to the now established pattern (Margolis, 1987).

This property of the brain to fix patterns of interpretation is of serious importance. It is, on the one hand, the way we cope with life; on the other hand, it is a primary blockage to creative insight. Creative insight occurs when there is a change in the underlying pattern in the brain. Fortunately the brain has other properties than fixity, which can be developed through certain practices.

New pathways in the brain are set up by certain kinds of mental impact. Usually these occur by challenge, stress and crisis. We are confronted by the unexpected. This is a costly way of pattern changing because it does not necessarily work very well. For example the difference from the norm of a new impact may be so great that it simply triggers emotional denial (Argyris, 1990).

However, by certain kinds of exercise we can develop the capacity to induce the pattern shift that is essential for reperception. Underlying these exercises is the requirement for certain kinds of qualities of thought and feeling. The big problem is that these qualities are usually not culturally available, with many forces of conditioning and habit preventing their acceptance and assimilation.

Creativity has a large literature. A brief useful synopsis for our time has been made by Montuori and Donnelly (2013). I will give a brief account of four main characteristics of the conditions for creativity which I believe are equally necessary for re-framing and reperception:

The first is *tolerance of ambiguity*. This is the ability to take to unstructured or open-ended situations in a positive and opportunistic way, and it is a basic psychological condition for creativity. (Tegano, 1990). The basic principle is that any truly creative step requires a deconstruction of current understanding and the adoption of a questioning stance. Questioning for a creative step takes a direction that cannot be answered by importing or applying known solutions or logic. Some new patterning is needed, and this does not come from a predictable sequence of reasoning. Nor can it be delivered on a predetermined time sequence. This means that the person engaged in the creative process may have to live through a period of what might be called 'consciously not knowing'. This state is hard to bear for people who have become overly dependent on having the answers, being right and impatient with waiting. Indeed this is not just a condition for individuals, but whole organizational cultures become fixated on behaviours and values which eliminate tolerance of ambiguity and hence suppress creativity.

This leads to the second characteristic of *learning from mistakes.* To illustrate how this is different from the behaviour of a traditional organisation, it is useful to consider a culture fundamentally based on exploration and improvisation; namely, jazz. Tackling the unknown, navigating complexity or allowing spontaneous creation requires a different orientation to mistakes or errors. In a creative culture, mistakes are a necessary accompaniment to encountering and responding to the new. By analogy with the way a leading jazz musician coaches his students, Barrett (1998) focuses the learning of managers in organizations:

> *"One implication for enhancing innovative action in organizations is to question the way we look at errors and breakdowns. How can people in organizations be expected to attempt something that may be outside of their reach if breakdowns are seen as unacceptable? …. Once errors are made, how do managers turn these unexpected events into learning opportunities, as imaginative triggers and prompts for new action?"* (Barrett, 1998, p611).

Montuori (1996), himself a jazz musician as well as an academic, makes a similar point with regard to another jazz teacher: *"Indeed, he showed us mistakes were a source of learning, not of shame, in the same way that a musician may cleverly use a 'bum' note to build a whole new phrase, incorporating it within the larger body of melodic development."* Montuori, 1996, P61

A third important factor in creative thinking is the *capacity to question one's own personal assumptions.*. In a competitive culture purporting to privilege rationality and analysis over imagination, the dominant forms of questioning of assumptions is attacking the assumptions of others. This almost invariably leads to defensiveness (Vaillant, 1992, p237-238). Something different is needed to evoke creativity; namely, voluntary self-examination of assumptions. In a culture where

security depends on 'being right', then changing one's mind is viewed as a sign of weakness. In the matter of creativity, if the mind isn't changed there is no room for novel ideas. The *whole basis* of reperception is changing one's mind. However, the creative aspect that distinguishes this from being persuaded of another idea, is the self-generating of new patterns.

It is useful to make a distinction between being creative, for example making a novel contribution in some field, and *reflective* creativity. A creative person can still end up with strong ego defences that hold to assumptions. The enduring conflict between Einstein and Bohr in quantum physics is a good example. In the field of management, Argyris (1985) has pointed out that defensive routines become ingrained in people and organisations through a process of defending previous decisions despite evidence they are failing, camouflaging the defence and then camouflaging the camouflage – a process he calls self-sealing. Managerial reperception is rendered difficult in the face of these psychological dynamics.

The fourth key factor is being able to *shift to new patterns of meaning*.

We can see an example of this patterning effect in our visual perception. For example, when we look at a two-dimensional representation of a three-dimensional object, the brain constructs a pattern or schema which looks like the real thing. However, perspective is a convention that has been invented and learned, so what looks real to us is actually a perceptual construct.

A similar process takes place in the area of our thinking where the brain forms personal constructs which are also partly interpretations and partly conventions. Much of this patterning is inculcated in our upbringing, culture and education. The tendency is to assume that these constructs are reality. This locks the mind up in a closed loop which it is difficult to get out of.

Any creative act, moment of insight, or reperception, is a shift in this basic patterning. We associate this with an 'aha!' experience. For such a thing to happen we have to increase the probability of brain pattern changes, and the conditions for these can be deliberately cultivated. Over recent decades, a large number of techniques have been developed to help this process (Mycoted, 2015) These techniques have been developed in order to overcome certain weaknesses in our human nature that block effective creative thinking.

These blockages can be thought of as creativity inhibitors. Three main ones get in the way of free play of the mind (Heirs and Farrell, 1986): they are 'rigid mind', 'ego mind' and 'Machiavellian mind'.

The rigid mind is one that has become set in its ways and values, and tends to become self-enclosed, being unlikely to believe that anyone else's thoughts that are different could be of value. Such a mind tends to get bound to rules, traditions, 'official' policies, and the dominant unconscious paradigm.

The ego mind tends to judge all ideas in a self-referential way. It may be open to ideas from outside, but only if this suits self-interest and self-importance. Both judgement and creativity get distorted, and genuine collaboration is difficult for such a mind.

Machiavellian mind is essentially a scheming mind that sees the forces that shape the behaviour of others and manipulates these subtly for purposes of power rather than creativity, especially where the power is based on a predetermined idea and outcome.

Each of these creativity inhibitors functions in a way that holds onto and defends the dominant mindset, which of course 'freezes' system boundaries (disabling boundary critique) and also determines what are seen as believable and unbelievable futures. Thus they also function as constraints preventing reperception or induction. Intentional means to overcome these obstacles are needed (Denhardt et al, 2013)

Moments of insight or creativity can be seen as a significant shift in pattern or gestalt usually accompanied by a release of energy, often in the form of humour. Humour plays a role in freeing up the mind to entertain (and be entertained by) disruptive patterns.

One of the most critical factors that sustains dominant patterns in the mind of a given person is that they are usually invisible to that person. This is why reflexivity and self-observation are crucial as enabling conditions for reperception. In some societies, practices such as mindfulness and meditation develop capacity to surface and question assumptions (Langer & Moldoveanu, 2000). These are not, however, part of the current formal training of systems or futures practitioners. Another helpful process is that of dialogue, understood as open mutual exploration between people in a manner that allows emergent insights. (Bohm, 1996. Christakis & Bausch, 2006) This usually requires skilled facilitation to encourage openness and questioning (Franco, 2006). Yet another way is the use of visual thinking techniques. In fields like design, engineering and even strategy formation, significant numbers of people do this with the assistance of a whiteboard, revisable markers, and often movable shapes (Hodgson, 1992). Used interactively, this could be called visual dialogue.

The main point here is that it is very difficult to question and reframe a pattern which is not yet seen. Practices which bring these patterns up into consciousness mentally, dialogically or visually, provide a way of engaging with the process of reperception.

9.3 Reperception as Enactive Cognition

Another quite different perspective on reperception I am exploring is that of enactive cognition. This view questions the representational, computational type of explanation given in section 9.1. This alternative approach places strong emphasis on the biological roots of cognition and implies that reperception must have its foundation in the organism – the neurobiological human. This approach distinguishes five important principles, namely: autonomy, identity, sense-making,

emergence and experience. In this section a full account is impossible, but I aim to highlight those aspects that give us some additional insight into the nature of reperception (Di Paulo and Izuka, 2007)

Not only do living organisms exhibit *autonomy* and identity, but so do the cognitive systems embedded in them (Di Paolo & Izuka, 2007). Cognitive systems have a capacity to self-generate whilst at the same time sustaining interaction with their environment. Viewed from this perspective, cognitive systems are agents in the creation of, or bringing forth, their worlds. In this sense they are 'gaming' the larger system comprised of organism and proximate environment.

Cognitive systems also generate the significance of their enacted world; they are *sense-making* (Weick et al, 2005). This significance is not a simple importation from sense perception of the environment, but an active creation in which the actor is creating the world enacted in. The highly interactive nature of the cognitive system enables the phenomenon of *emergence*, which can be seen as the formation of novel properties (concepts, insights, schemas) which cannot be entirely attributable to their antecedent properties. In this view, cognition is an aspect of life and therefore participates in the properties of life. If this is also a property of reperception, then anticipation in futures thinking, though requiring a grounding in empirical knowledge, is unlikely to arise from it in a solely 'rational' way.

The fourth concept of *embodiment* represents a major challenge to the computational representation model. Embodiment implies that the mind is inherent in an active, animate body and is not a separate meta-system (Maturana & Varela, 1987). This has significant implications for the ways that both systems and futures practices can make themselves really effective in engaging with the disjunctive shifts that are reperception. For example, what physical activity has the possibility of generating insight in a way impossible in the habitual culture of 'sitting in chairs'?

The fifth characteristic of *experience* brings us to the link with reflection. If, as the enactive school affirm, experience is fundamental to cognition and inseparable, then there is an indispensable place for the observer in the observation. Di Paolo et al (2007) indicate that play may be an important aspect to explore; this, in my view being quite compatible with both 'graceful entry' and with creativity:

> *"We find that play is an area particularly rich for the exploration of enactive themes from emergence of identities and levels of social coordination, to manipulation of sense-making through experientially-guided bodily action. Perhaps no other framework is better placed to explain play and its paradoxes and this may be why there is such a paucity of references to play in cognitive science. When a child skilfully supplements the perceptual lack of similarity between a spoon and a car by making the spoon move and sound like a car he has grasped in an embodied manner the extent to which perception can be action-mediated. With his body he can now alter his sense-making activity, both on external objects, as well as his own actions and those of others. He has become a practitioner of enactive re-creation."* (Di Paolo et al ,2007,p 40).

This view is not dissimilar to the view of Winnicott (1969) mentioned in the previous section.

Reflection on Chapter 9

Markley (2012) and Miller (2011) both see an important role for creativity and imagination in futures work, taking a position that the future is open. I concur with their view that, although much futures work needs to be grounded in scanning and analysis, in terms of strategic decision making on any scale there needs to be scope for going beyond the data.

In this sense perhaps reperception is a stepping stone, but not the full story. Reperception implies seeing things differently. For example, a good set of scenarios will help loosen the fabric of assumptions in a decision maker's mind and enable a new perspective on both the known and the unknown in relation to their strategic concern. Such events can be quite shocking to the experiencer, the shock being threatening or opening opportunities.

Induction is one way of looking at this. A crucial aspect of this often rejected is the recognition and acceptance of anomalies; things which don't fit the usual set of assumptions. I have seen this rejection mechanism work powerfully in executives' minds and it strongly biases what they take away from a scenario impact exercise. I have also seen executives who initially were highly sceptical of a given scenario reach a point of insight where the whole way they saw the future unfolding shifts. The consequence is also a change in the kinds of decision that were framed and taken.

Reperception as creativity is perhaps stronger in the context of entrepreneurial activity. The entrepreneur is not only reading possible futures differently from the mainstream, but is imagining how to make the future turn out differently from what is generally expected. There is a 'make the future happen' component. This is not independent of insightful reading of the environmental trends. Successful new enterprises often are led by people who see a wave of the future coming but modify it by 'surfing' the wave with new products or services. For them, that future is now, but it has not yet been unfolded and distributed.

Reperception as enactive cognition emphasises that a passive analytical stance is unlikely to be sufficiently grounded in real world happenings and trends to be sufficiently convincing. On the other hand this can lead to the development of positive techniques to establish new futures. Japanese companies, like Honda, who embedded their engineering managers in California to pick up on the opportunity trends rather than study them from a distance, are an example (Mintzberg et al, 1996). Some very successful innovative leaders, like Steve Jobs, have participated in detailed design in a way contrary to the bureaucratic model of 'hands-off' management. They have lived in and with their new products in a very assertive way. (Celse, 2014).

As a facilitator of strategic workshops with senior managers and research teams, I have found all three perspectives contribute to ways of creating designs and interventions that help open things up for occasional breakthrough.

****

Chapter 10: Life, Consciousness and Anticipation

10.1 The Emergence of Second Order Science

The field of the system sciences has historically been quite fragmented despite its pretensions to be integrative and cross disciplinary. One of the main contentions is between the so-called hard methods and the soft methodologies which prompted Midgley (1996, 2001) to make a strong case that this is counter-productive and that from the perspective of the unity of science, an inclusive approach of methodological pluralism is far better.

> *"Methodological pluralism involves the development of philosophical theories that explain the methodological diversity that is needed if we are to conduct transdisciplinary research…… this should not be seen as a final product, providing all the insights necessary for systems science, but as a first attempt at a new way of thinking about systems practice"* (Midgley, 1996, p35).

This is helpful but it does not deal directly with the distinction between first order and second order methodologies. Second order reflexive concepts and methodologies do not share the fundamental paradigm assumptions of first order science. The challenge here is not just the integration of conflicting schools of systems thinking but also the emergence of a new paradigm of science itself. This is a huge topic in itself, beyond the scope of this thesis, but, nevertheless, it is necessary to go some way to indicate the nature of this 'sciencia nuova'. The roots go back to certain principles proposed in response to the Cartesian paradigm that are much more consistent with systems science. but which until recently have been pretty much sidelined.

As far back as the 17th century Vico who lived 1668 to 1744 proposed a new science with key distinctions from the rapidly dominating science based on Descartes, Newton and Leibniz. For an account see Pompa (1975). The dominant success of Cartesian science has side-lined consideration of an alternative and valid science. But as pointed out earlier, the world of complexity does not conform to this Cartesian view of science.

Despite the long time gap there is a relevance today of Vico's thinking, pointed out by Morin (2008). *"The scienza nuova proposes something with incalculable consequences. It is simply this: the object must not only be appropriate to science, but science must be appropriate to its object."* p33

The implication is that science has a cybernetic relationship to the objects of its study which, given the qualitative infinity of the universe, (Bohm, 1957), implies that a single paradigm of science, despite its successes, also leaves us ignorant of our blind spots.

Generally speaking, the trend in science has been away from the qualitative. For example, the methods of physics, even mathematical physics, are not usually considered appropriate to biology, the science of living things. Elsasser (1998), one of the mentors of Rosen (1986), took the view that

biology needed a much richer science within which the science of physics was reduced to special cases.

My approach to the synthesis of systems and futures requires us to step out of the reductionist paradigms and consider the promise of second-order science. This will be considered from four perspectives that extend the ideas considered by Muller and Riegler (2014):

a) Goodwin's (1997) notion of a science of qualities and his case against genetic reductionism
b) Rosen's (1991) case against biological reductionism from his book Life Itself, building on Elsasser's (1998) views
c) The emergence of second-order science from 2nd order cybernetics, especially von Foerster (1979) and Umpleby (2014).
d) Morin's (2008) case against mental reductionism

The science of qualities requires experiential, participative knowing – this arises through relational engagement – the observer seeks a deep and intimate sense of connection. Goodwin's criteria for a science of qualities come from six attributes he sees arising out of complexity, namely a) rich interconnection, b) iteration, c) emergence, d) holism, e) fluctuations, f) edge of chaos.

Goodwin was a biologist and was particularly critical of reductionist Darwinism. The gist of his argument against reductionist genetics is that it ignores that life is taking place in a world of complexity.

> *"The problem is to what extent the overall properties of living systems are the result of contingencies instead of emergent, universal phenomena. ..... species are basic units of more complex systems with emergent properties. Modern population genetics lacks any trace of such ecosystem-based dynamics: species are considered almost as isolated entities coupled with an external environment. Still worse, species are considered as boxes of genes, with the individual genes treated almost as isolated entities whose frequencies change as a result of natural selection."* (Sole & Goodwin, 2000, p250).

Rosen's enquiry went beyond understanding the processes of biology and focused on the question, what is life itself? He argued that biology is the study of life as the soma; which is what is alive, the heart of the organism. We cannot answer the question "what is life?" with the answer "it is a machine". He based this on a view that entailment (necessary consequence) is a key property of living complexity. Louie (2013) points out that the importance of entailment is that the real nature of living systems is not conveyed by their material basis but by their relational functions. He also argues that complexity is not life itself. Life is better understood as relational. He advocated the need for a different mode of science to relate to biology in this sense of somatic life.

> *" ...it seems to me that the duality between "hard" or quantitative science and "soft" or qualitative science rests on an entirely false presumption. ...it is not a question of doing physics or not doing science. It is rather a relative question, of simplicity versus complexity."* (Louie, 2013, p10)

Umpleby (2010) describes the development of new methods for conducting enquiry in terms of four models. Each model follows the correspondence principle in that each step includes the preceding step as a special case. The steps are 1) linear causality 2) circular causality 3) complexity theory 4) reflexivity theory. The main property of a reflexive system is that it includes the observer in what is observed and the observer is in some way participative. (See section 4.1) Second Order Science (Umpleby, 2014) changes the logic of inquiry to

- Include the observer in the system observed
- Recognize that, especially In the social sciences, theories can change the phenomenon observed
- Include knowledge that is organized as methods as well as theories
- Add the dimension of time to resolve problems involving self-reference which are incongruent in just space

To Morin (2008), both reductionism and holism suffers the same limitation in their assumptions; that splitting parts and wholes as an operation does not lead to deeper understanding of complexity.

> *"The conception that is revealed here places us at once beyond reductionism and holism, and summons a principal of intelligibility that integrates the portion of truth included in each; there should neither be annihilation of the whole by the parts nor of the parts by the whole. It is essential therefore to clarify the relations between parts and whole, where each term refers back to the other. 'I consider it as impossible,' said Pascal ,'to know the parts without knowing the whole, as to know the whole without a precise knowledge of the parts.' In the 20th century, reductionist and holist ideas still do not measure up to the level of such a formulation."* (Morin, 2008, p101).

Bortoft's (1996) in-depth study of real and counterfeit wholes reveals the same insights. He makes the point that we have two ways of talking about wholes and parts, both of which are confused. One view gives primacy to the part and describes the whole as an assemblage of parts. This assemblage may interconnect the parts into what we call a system but nevertheless any behaviour as a whole is considered to be emergent and secondary. The other view gives primacy to the whole and so this determines the nature of the parts as subservient to the whole. Bortoft considers this to be making the whole a false transcendental that comes earlier than the parts or considering the whole as some kind of 'super part'. From this perspective a great deal of systems thinking is prey to this false dualism. Indeed, the whole of first order science is caught in this trap.

> *"It is because of this reversal that the authentic whole must be invisible to the scientific approach, as currently conceived. The paradigm for modern scientific method is Kant's "appointed judge who compels the witnesses to answer questions which he has himself formulated." Science believes itself to be objective, but it is in essence subjective because the witness is compelled to answer questions which the scientist himself has formulated. Scientists never notice the circularity in this because they believe they hear the voice of nature speaking, not realising that it is the transposed echo of their own voice. Modern positivist*

> *science can only approach the whole as if it were a thing among things. Thus the scientist tries to grasp the whole as an object for interrogation. So it is that science today, by virtue of the method which is its hallmark, is left with a fragmented world of things which it must then try to put together."* (Bortoft, 1996, p17).

Management science, as an aspect of science as a whole, has largely taken first order science as its model. To tackle the complex as distinct from the complicated world, we do not need to cast aside the decades of development of management science; rather we need to assign them a diminished role and realise that the dominant paradigm of science itself needs reforming into a science which includes consciousness and the human quality as primary factors. Theoretical physicists like Goswami (1995) have made incursions into the idea of consciousness as a primary basis of a coherent quantum physics. The idea of decision integrity opens up a field for exploring self-aware management. The disciplines surrounding the idea of second order cybernetics and Trans-Classical Systems Theory offer a potentially fruitful basis for reframing decision science. Locker (1997, 2007) believed that the strengths of General Systems Theory could be retrieved if it moved beyond the constraints of classical scientific thinking. He believed this could be achieved by more clearly outlining the role of the observer of a system in view of the system's perceivable nature, and also by introducing non-classical thinking to the propositions deriving from a *meta*-level of systems observation.

These lines of inquiry start coming together reveal a more robust project to characterise and develop second order science (Muller & Riegler, 2014). The main characteristics sufficient for this stage are now described.

A starting point is the cybernetics of observing systems. This invokes various forms of circularity, whether logical or systemic, which are problematic for first order science and even seen as error. There are, however, difficulties needing resolution here. (Fullsack, 2014)

The inclusion of the role of the observer leads naturally into the aspect of self-reflexivity both in relation to the domain of interest and in relation to observers (Umpleby, 2014). Reflexivity also impacts on the communication of science itself as exemplified in the field of climate change. (Aufenvenne et al, 2014). From here we can consider the manner in which the observer is observing. In so far as second-order science embraces transdisciplinarity, a 'poly-ocular' stance is proposed. (Alroe & Noe, 2014).

There is clearly a relationship to be explored between second-order science and phenomenology. This applies especially to the relationship with cognitive science. (Voros, 2014) A circular relationship is proposed between lived experience, phenomenology and cognitive science. Applied to the practice of second-order science the practitioner would need to be researcher, generator and transcendentally mindful in dynamic combination. This idea will be developed in relation to systems and futures in Chapter 16.

The emerging field also throws light on the role of the media in relation to science. Beyond Realist epistemology, the discovery of hidden assumptions and of reflecting their consequences needs to play a role. (Volker & Scholl, 2014)

My interim conclusion is that, in endeavouring to take a second-order approach to methodology, it is necessary to include the observer with the impact of the observer's theories on the system of interest. A key 2nd order operation is re-entry on first order components. There is a shift from simply framing to framing the framing; that is meta-framing. This implies questioning of assumptions that may otherwise be taken for granted in first order science. The questioner himself or herself (in my case 'I') is not excluded from the discipline. Personal bias is modified by taking multiple perspectives which, in combination, may reveal blind spots and expose unhelpful assumptions. The exposure of deeper assumptions is itself a spur to creative thinking and innovation.

> *"The first function of second-order science lies in its role of triggering innovations and inventions, which has been marginalised so far. Through re-entry into first order building blocks such as concepts, theories, models and mechanisms, a large number of new, highly challenging and mostly unexplored research problems are generated. In other words, second-order science serves as a 'novelty pump'. Since most topics at the second order level are largely unexplored, second-order research becomes a vital innovation engine for science research in general."* (Muller & Riegler, 2014, p12-13).

The question of the observer also raises the question as to the role of multiple observers of the 'same' thing. Further, multiple observers may be in constructive interaction regarding the focus of their observation It is worth noting in this respect the work of Christakis and Bausch (2006) who developed a practice known as Dialogic Design Science (DDS). Their work is partly based on the approach to extending the paradigm of science proposed by DeZeeuw (1997) which describes first-phase, second-phase and third-phase science. His point is that whichever scientific discipline we operate from implies a preferred framework and hence affects what is considered to be 'the reality'.

First-phase science is equivalent to first order science as described previously. "*First-phase science assumes an immaterial observer and a material world that can be understood in terms of essences*." (Bausch & Flanagan, 2013, 421). Observations are considered observer independent and independently verifiable by multiple observers who are 'outside' the object. Second-phase science continues to assume a single observer but includes a realization that its descriptions are constructed. *"Observer-dependent observation also uses a single observer and that observer's lens but recognises that the observer and the object are embedded in the same reality."* (Bausch & Flanagan, 2013, p422). Third-phase science specifically acknowledges the interdependence of observers around a common object.

> *" Third-phase science seeks and respects frameworks for making observations from multiple and distinct observers to more fully understand the inclusive context of an object. The language that determines the object of discussion is established through the interaction of involved observers. Science in this phase deals especially with desired behaviour and social change."* (Bausch & Flanagan, 2013, p42).

Dialogic Design Science (DDS) has a strong dialogic process component to enable mutual constructed languages to emerge and lead to self-constructed objects suitable to the occasion. This may appear, as Bausch and Flanagan (2013) affirm to be more relevant to social and cultural situations, especially where decisions regarding action and intervention are concerned. However, I find it interesting to view the principles of DDS in relation to the science of qualities proposed by Goodwin (2007). Referring to the research of Welmsfelder (2000) on perception of qualities in animals through intersubjective correlation between observers, he concludes:

> *"This capacity we have of direct knowing about the qualities of the whole is often described as intuition, non-inferential perception. A basis is thus provided for extending the procedure of scientific consensus of observed properties of natural processes from analysis of quantities, relating to the properties of the parts, to the intuition of qualities, which refer to the properties of the whole."* (Goodwin, 2007, p73).

What I am pointing to here is that the methods of third-phase science may form part of a continuum of second-order science which extends from human affairs to biology and even beyond. This is especially important as we go on to consider the nature of anticipatory systems, it is important to bear in mind the distinctions between first order science and second order science since we risk reducing the nature of anticipatory systems to something to fit into the paradigm of fragmentation and summation characteristic of first order science.

10.2 The Basic Nature of Anticipatory Systems

Poli, in his review of the many forms of anticipation (Poli 2010), points out a fundamental issue in considering the nature of systems which are, in some way, able to anticipate the future. Considering such systems brings into the arena a linking between the phenomenology of time-consciousness and the nature of systems that function within a temporal order. Poli states:

> *"Behaving in an anticipatory way means adjusting present behaviour in order to address future problems. In other words, an anticipatory entity (system or whatever) takes its decisions in the present according to forecasts about something that may eventually happen. The best-known definition of anticipation is Rosen's: "An anticipatory system is a system containing a predictive model of itself and/or its environment, which allows it to change state at an instant in accord with the model's predictions pertaining to a later instant".*
> (Poli, 2010, p8).

In this section I will expand on Rosen's definition in a way that offers the possibility of integration with the phenomenology of the present, especially with regard to its properties of retention, perception and protention [25]. Rosen's primary concern was the nature of, as he put it, life

[25] See Chapter 7 where the use of these terms is explained

itself. He points out that life vanished as an explanatory principle with the rise of mechanics and the prevalence of reductionist science. Treating anticipation as a fundamental distinguishing quality of living entities from material entities, it is necessary in systems terms to go beyond the basic concept of feedback. A feedback loop will feed into the present of a system information regarding past relationships of the system, which clearly can be of value in adjusting its present behaviour. But if the only information feeding back into the system is from the past then it does not sufficiently meet the criteria for an explanation of anticipation. It is necessary that the system is able to adapt its behaviour also including information from the future. The simple term Rosen (1985) used for this is feedforward.

The foundation of Rosen's (1985) concept of anticipatory systems is in relational biology. The term was coined by Rachevsky[26] to provide the term for an approach in which no collection of separate descriptions or models of organisms, however comprehensive, could be cobbled together to capture the organism itself. He saw that some new principle was needed if this were to be accomplished. Rosen continued to search for principles that would account for the way in which physical phenomena in living things are organised. He also drew on Elsasser's (1998) conclusion that organisms are governed by their own biotonic laws, which do not contradict physical universals but are simply not derivable from them. A biotonic law is a law of nature which cannot be contained in the laws of physics.

One of the examples used by Rosen is that of protein folding. He considered conventional biology's claim that phenotype is simply a chemical concept as astonishing. He pointed out that protein molecules must have more than mere schematic structural formulae, more than just primary structure. They also must have shapes, forms, confirmations of precise geometrical nature. The tertiary structure of active molecules has folds and bends which confer upon the molecule is characteristic shape, and hence its activities. These shapes themselves are not coded in the DNA and so the question arises, where did they come from? It is possible to denature and unfold an active protein which, when restored to more normal conditions, will re-fold itself, autonomously. All of its activities are recovered very quickly and very accurately. He claims that this process is not algorithmic and computable. He says that if this is chemistry it's not the familiar contemporary chemistry of reductionist science (Golumbia, 2013). He infers from this that Soma is not a machine which has implications for the capacity of life to respond to influences which are more subtle than the deterministic paradigm suggests.[27]

[26] For a brief account of Rachevsky's thinking see Rosen, 1991, pp109-113

[27] This point can be cross referenced to Section 7.2 on the nature of syntropy and Fantappie's notion of life privileging the future over the past.

So life itself is not a machine and has the capacity to anticipate. So how can we think about life as an anticipatory system? Rosen constructed a model to account for anticipatory behaviour. The basic version is shown in Figure 10.1

In the diagram, S stands for system, which may be an individual organism, an ecosystem, or a social or economic system. At first view, S is an ordinary non-anticipatory dynamical system. M represents a model of S. The behaviour of S is considered to be taking place in conventional real time.

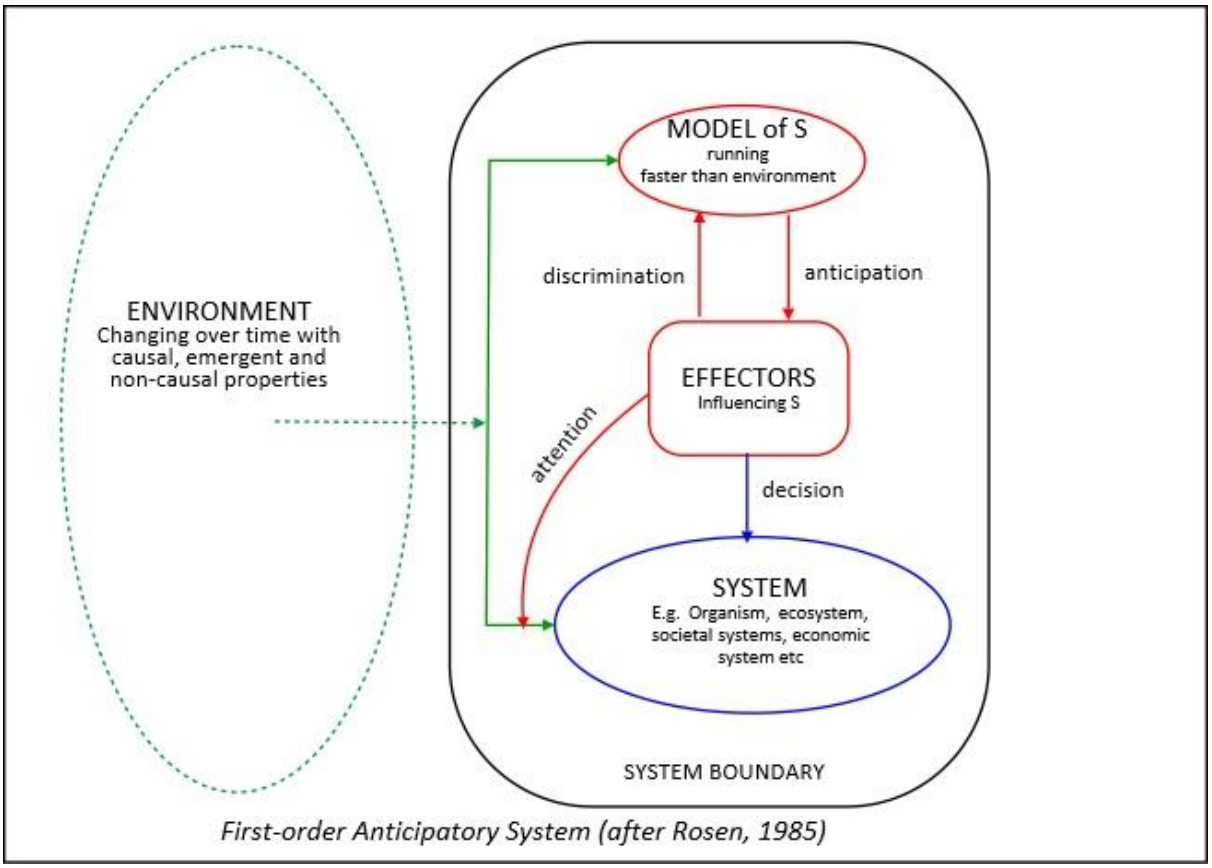


Figure 10.1 Adapted from Rosen's Anticipatory System, (Rosen, 1985, p13).

The behaviour of M, however, is taking place in a time variable which goes faster than real time. This means that after a fixed interval T then M will have proceeded further along its behavioural trajectory than S. In this way, the behaviour of M predicts the behaviour of S; by looking at this stage of M at time T_1 we get information about the stages that S will be in at T_2. M and S are set up to interact in specific ways. Suppose system M is equipped with a set E of effectors which allow it to operate either on S itself or on the environmental inputs to S, in such a way as to change the dynamical properties of S. The whole system will now be adaptive such that prospective future behaviours determine present changes of state. Anticipation would require the further property that M can discriminate between desirable and undesirable states and can change the dynamics of S in a way to avoid the undesirable region as well as cope with mutual possible trajectories in the future.

If S is a planning system then we can make further propositions from this model. To be anticipatory beyond adaptability, the system needs to be open to interactions that enable M to be revised and extended beyond inherited experience (feedback) and the system needs M to be able to reframe and re-perceive its advance running in the light of an anomalous situation that is not yet experienced (feed forward).

Of course, this raises the question as to how can information from the future be acquired by the system in question. There are two ways of approaching this. The usual one, which in some way bows to the domination of reductionist science and a linear view of time, is that an anticipatory system contains a predictive model of itself and its environment which enables it to make choices which are not entirely based on past information. In scenario planning circles this is referred to as "memory of the future", a term put forward by the neuroscientist Ingvar (1985). The unusual one, which I will explore further in Chapter 12, is that in some sense aspects of the future already exist and therefore an anticipatory system might also have the capacity to pick up information regarding the future which is neither inferential nor based on a predictive model.

It is important to realise that an anticipatory system is not restricted to life. From a systemic structure point of view a case can be made that the physical world is itself anticipatory; it is simply that we are not used to looking at it that way (Ferret, 2010)

The concept of anticipatory systems needs some setting in the context of second-order science. Rosen's idea that an anticipatory system is one which contains an internal predictive model of itself and its environment is not the property of a reactive system. Systems based entirely on feedback from past behaviour and situations, however sophisticated, are essentially reactive. They can only respond to changes that have already happened. In contrast an anticipatory system not only responds this way but is continually sense-making in the present and taking into account futures that have not yet happened. The similarities here with Beer's role of System 4[28] in the Viable System are striking.

From a second-order perspective the case can be made that such anticipation is facilitated by the reflexive nature of an observing system which is able to ask itself what its view of the future is. In first order science the notion of anticipation is problematic due to what has been summarised as 'the zeroth commandment', that future states cannot affect present changes of state. In second-order science the nature of time and causality are open and so the possibility of a theory of anticipation is more plausible. Especially important in this view is the concept of inferential entailment in mathematics which is considered to correspond to forms of enactive relationship in biology. Indeed a field of relational biology is emerging (Kineman & Poli, 2014)

[28] For an introduction to Viable Systems see Beer (1985).and Section 14.2

Louie (2010) considers that this 'information from the future' is not actually from the future but is information about self, species and the evolutionary environment encoded in the organisation of living systems. This is the idea of model-based behaviour where the model can contain aspects that are speculated future states not directly derivable from past causality. I shall propose later that this view is still overly confined in the first order science paradigm of linear time.

Having said that, Louie (2010) does make a strong case for the admission of the 'forbidden' concept of teleology to legitimately re-renter science. Discussing this in the context of the Aristotelian four causes he points out that three of them (material, efficient, and formal) are congruent with Newtonian physics but the fourth, final cause, is rejected.

> *"We now consider the assertion that anticipatory systems involve teleology or final causes in an essential way, and thus must be excluded from science. Feedforward behaviour seems telic, or goal*-directed*. The goal is in fact built in as part of the model that connects predicted future states and present changes of state. But the very suggestion that a behaviour is goal-directed is repellent to many scientists who regard it a s a violation of the Newtonian paradigm."* (Louie, 2010, p24)

This violation, however, becomes irrelevant in the context of the demonstration, for example by Smolin (2013), that the Newtonian paradigm itself violates the existential nature of time and therefore cannot be regarded as an adequate comprehensive frame for considering what is scientifically acceptable.

It seems to me that there are at least two major areas in which the nature of anticipatory systems need to be examined. Firstly, in the model in Figure 10.1, the power of anticipation is vested in the model M that runs itself faster than real time. In this sense, the model is unfolding consequences faster than the course of actual events. Wack (1985) illustrates this in his notion of 'predetermined elements' using the example of the river Ganges. Living in Benares, people are prone to sudden and massive flooding. Someone living upstream in the Himalayan foothills is aware of the onset of the monsoon rains. A rapid communication to Benares alerts the people what is to come, thus enabling anticipatory behaviour. This has an equivalence to the model 'running quicker'.

However, as we shall see from the development of the concept of present moment, considering anticipatory systems as taking place only in the dimension of linear time may itself be a form of reductionism and obscure additional possibilities in our blind spot. Firstly, I shall explore in Chapter 12 other concepts of M beyond running faster in time that open up potential new explanations for anticipatory behaviour. Secondly, from the perspective of enactive cognition, the very use of the notion of model may be inappropriate. Or put another way, in an anticipatory system, is M 'software' or is it 'wetware'[29]? In section 5.3, recent research on the neurological default systems was referred to. This seems to be the living enactive source of behavioural anticipation in the brain and therefore

[29] 'Wetware' is a colloquial term used to describe the computing power of biological material e.g. a brain

the way this biological system operates may be a correlate with the anticipatory function. This leads us to consider anticipation as a lived experience and even as inbuilt into the nature of things. (Poli, 2010)

The coupling of time consciousness and anticipatory system provides the foundation for the synthesis which follows in the next chapter.

Reflections on Chapter 10

Rosen was developing his ideas on anticipatory systems thirty to forty years ago before the idea of second-order science was emerging, and his work seems to have had little connection with the cybernetics of cybernetics of von Foerster (1979). Quite independently, thinkers including Goodwin (2007) and Bortoft (1996) were considering the need for a science of qualities. In addition Di Corpo and Vanini were pursuing the ideas of synergy suggested by Fantappie[30]. What is interesting is that all these authors were, in different ways, engaged in theoretical biology and the phenomenology of nature. In all of these approaches there is an emphasis that what is being observed and understood 'scientifically' is a function of the scientist as an experiencing self.

The emergence of consciousness studies over the last twenty years has itself wrestled with its own terms of reference though not postulating a different variety of science. However, some authors in this field have attempted an integral approach in which the neurobiology of the scientist is a factor in the definition of science. One version of this is Searle (2000) who proposes a view that could be a step towards a neurobiology of second order science:

> *"The unified field of consciousness is a biological phenomenon like any other. It is entirely explained by neurobiological processes. Among those processes are those that cause and realize volitional consciousness, the consciousness of deliberating, choosing, deciding and acting. Given certain assumptions about the nature of these processes, their existence requires a self. The self is not an entity in the field, but it determines a set of formal constraints on the operation of the field. The neurobiological phenomenon of the freedom of the will amounts to two principles:*
>
> 1. *The state of the brain at t_1 is not causally sufficient to determine the state of the brain at t_2 and t_3.*
> 2. *The move from the state at t_1 to the state at t_2 and t_3 can only be explained by features of the whole system, specifically by the operation of the conscious self."*
>
> (Searle, 2000, p19-20)

To the extent that a scientist has the freedom to choose assumptions, hypotheses and interpretations of the empirical then both second-order and first order science are actually inherently second-order. By this I mean that the assumption of deterministic reductionism, the zeroth commandment and the exclusion of the observer from the observation are themselves second-order choices by a cybernetic system which has decided not to acknowledge its own unavoidable state of

[30] For a brief account of Fantappie's contribution see Di Corpo and Vanini (2011)

consciousness. In this view, second order science is the default and first order science is the exception! First order scientists have agreed an intersubjective worldview excluding the observer and then, as observers, forgotten that.

The implications of this for a science of anticipation are, in my view, crucial. An aspect of the feedforward in anticipation is to choose to act in a way that is not confined to a causal relationship between state t_1 and t_2. The exercise of what Searle refers to as deliberating, choosing, deciding and acting are, so to say, in the interstices of the time flow.

How this might be will become clearer when the enriched notion of the present moment and its constituent dimensions is explained in Chapter 12. This requires a preliminary gathering of a number of ideas gathered into this work so far. These will be recapitulated next in Chapter 11 to provide a platform for synthesis.

****

Chapter 11: Platform for Synthesis

11.1 The Themes for Synthesis

There are six strands of inquiry that now need bringing together to effect a synthesis which will be made in the next chapter. They are shown in Figure 11.1 below:

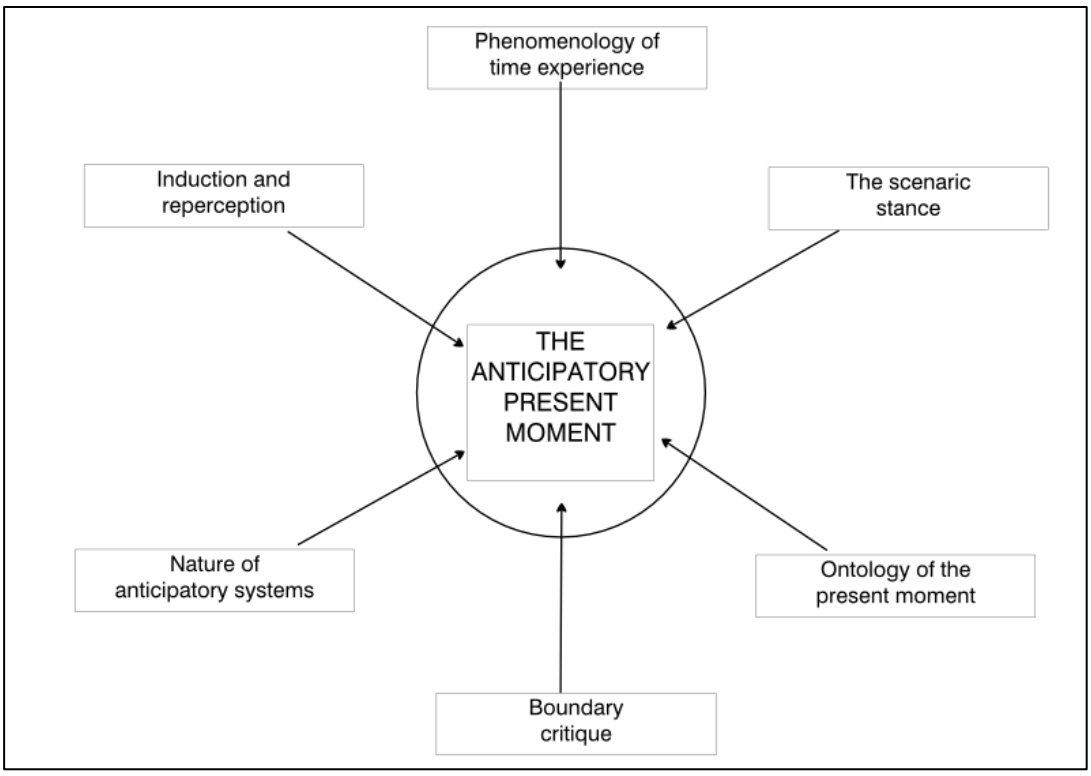


Figure 11.1 – The six themes of transdisciplinary synthesis

The six themes will now be recapitulated to make it clearer what is being integrated in this transdisciplinary exercise. Any repetition of previous content is deliberate and intended to help the reader bring it all together for synthesis in his or her mind.

1 Husserl's Model of Time Consciousness

Husserl developed his theory regarding the problem of the continuity of the perceptual present to contrast to the conventional idea that now is a 'thin' present between the future and the past. Instead he saw it as a 'thick' present. For example, if we are listening to a note played on an instrument we hear it as a continuous duration. When we part way through, the sound of the first second is no longer audible. In terms of our experience, however, it is still present tone that we are hearing. The meaning of the tone in, say, a musical work, is evoked in relation to its future ending.

The immediate experience of the earlier part of the sound is not the same as a memory of that sound. There is a distinction between *retentions of experience* and memories of that experience. The

present future of the sound is *protention* as an extended present (see Figure 11.2). The idea of a knife-edge present, or a thin instant, is abandoned. Retentions are qualitatively different from memory reproductions in that they are all part of the current consciousness of the present. Protentions also contain elements of the emergent proximate future, which can be distinguished from fantasised futures. The present moment thus contains elements of both past and future, experienced as an extended now.

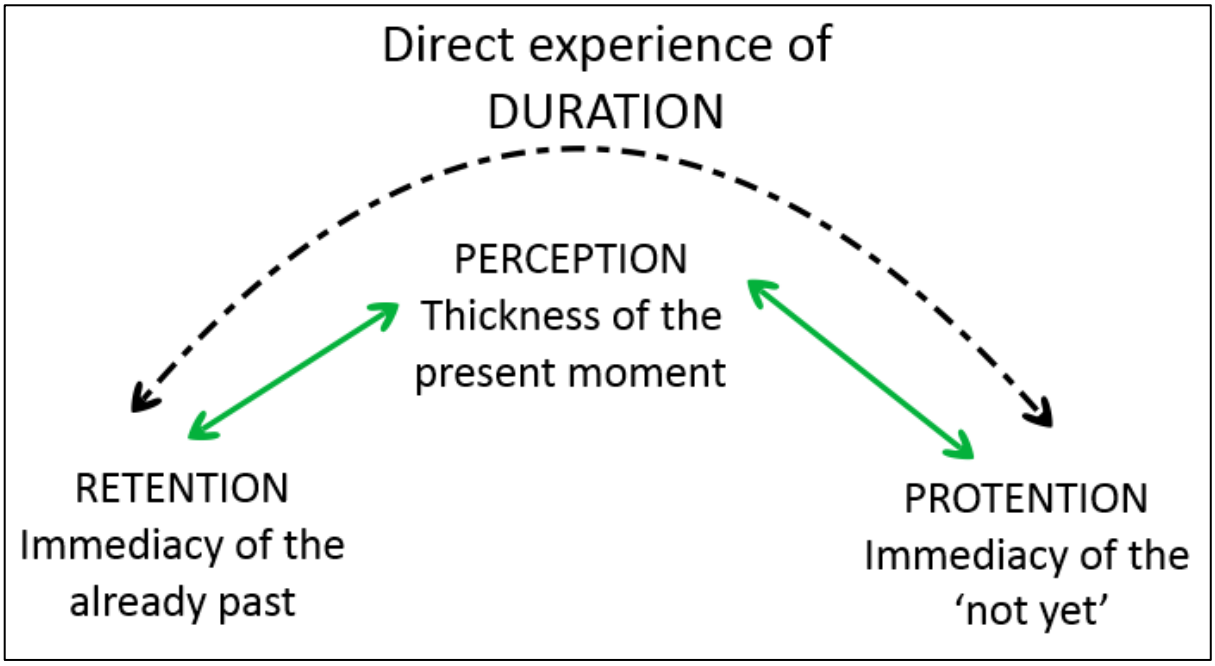


Figure 11.2 Representation of Husserl's Present

11.2 The Basic Nature of Anticipatory Systems

In Chapter 12, rather than focussing on adaptive systems as such, I build on Rosen's definition of anticipatory system in a way that integrates anticipation with the phenomenology of the present as the properties of retention, perception and protention. For such a step it is necessary to go beyond the basic concept of feedback as in adaptive systems. A feedback loop will feed information into the present of a system regarding past relationships of the system, which has limitations of value in adjusting its present behaviour to an unknown future. It is necessary that the system also has the property of feedforward in order able to adapt its behaviour to be ready for the 'not yet'.

An anticipatory system needs a way that information regarding the future can be acquired. One way is that an anticipatory system contains a predictive model of itself and its environment which enables it to make choices which are not entirely based on past information. Another way is that in some sense, aspects of the future already exist and therefore an anticipatory system has the capacity to pick up information regarding the future which is neither inferential nor based on a predictive model.

This requires two distinct channels of information input as shown in Figure 11.3, one from the past retention side and the other from the future protention side.

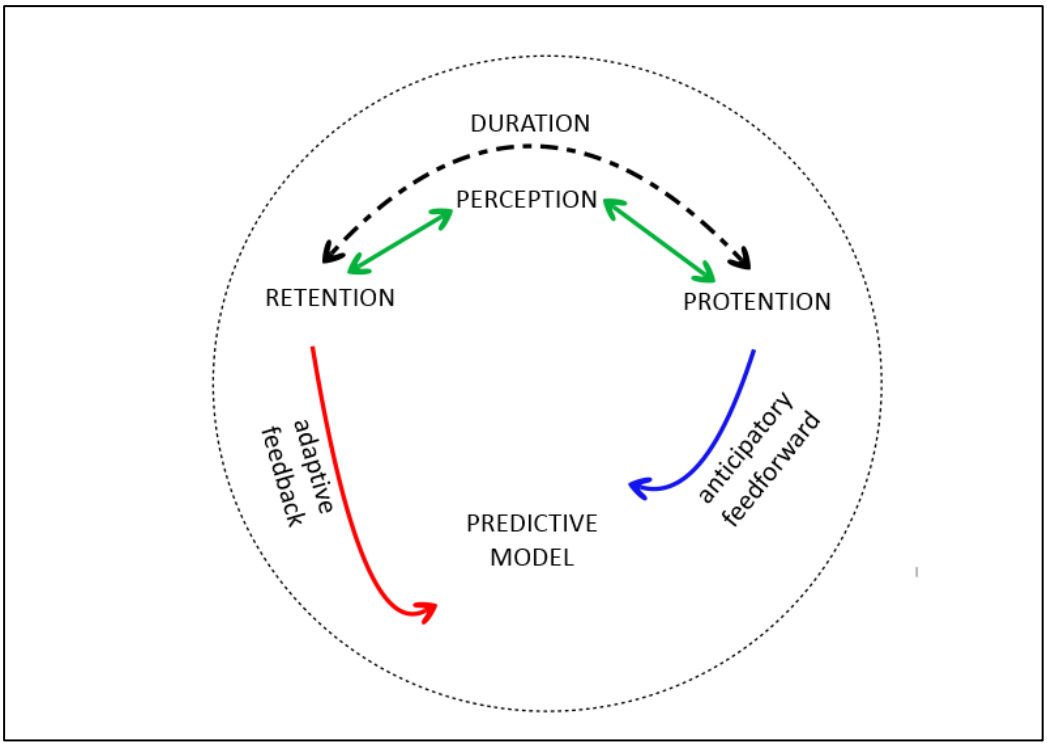


Figure 11.3 A Phenomenological View of Anticipation

11.3 The Ontology of the Present Moment

This topic is considered in some depth in my paper on the subject (Hodgson, 2013). The essential features that need to be borne in mind for synthesis are recapitulated here. Poli's (2013) distinction between a thin and a thick present moment supports the idea that the present should be considered an extended duration that interfaces between the past and future, which is in contrast to it being a knife edge between the past and the future. The thickness of the present moment is related to a sense of dimensionality that is both measurable, in the sense of dimensionality in physics, and phenomenological, as in the Husserlian (1903) and Bergsonian (1910) notion of duration. Six dimensions of experience: namely, traces and memories; interacting commitments; passive forms; active patterns; expectations and hopes; and capacity for creative decisions. This idea is summarised in Figure 11.4.

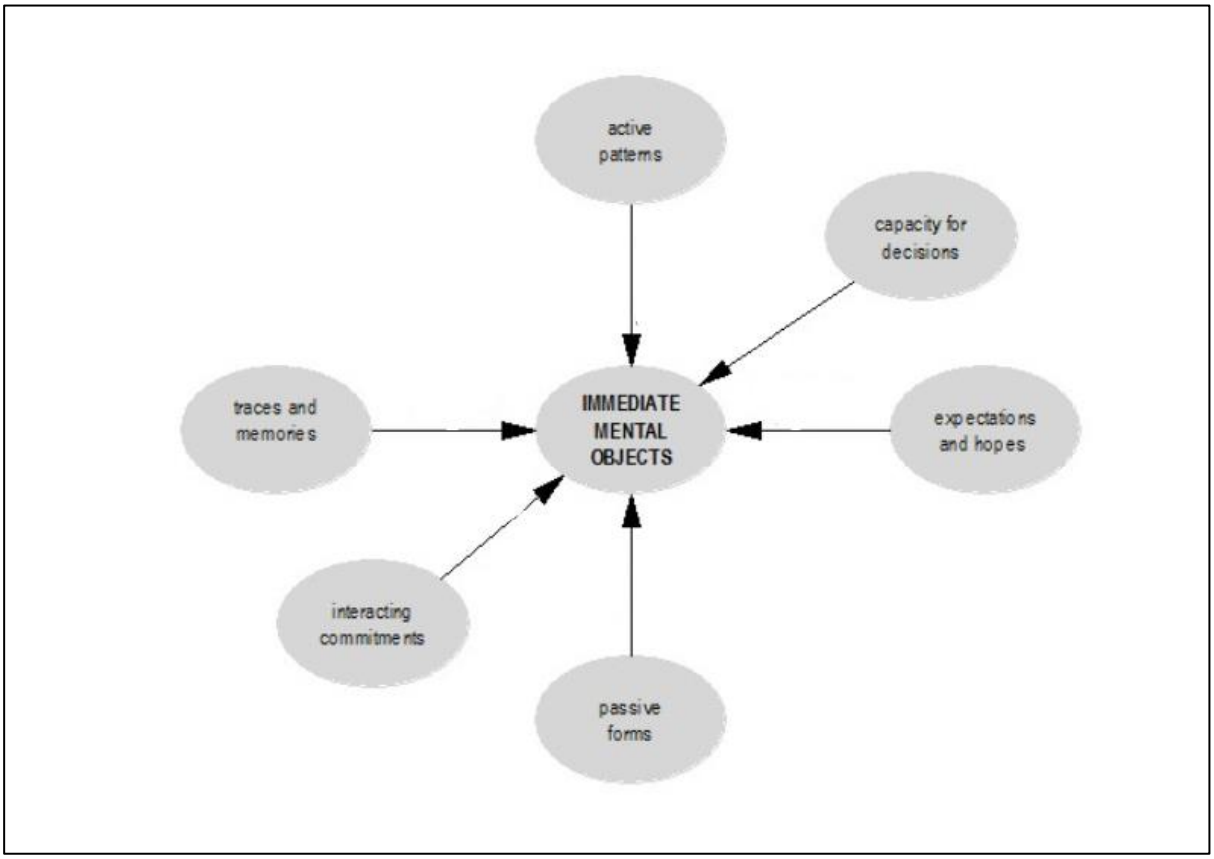


Figure 11.4 – The Experience of the Present Moment, after Bennett (Hodgson 2013)

11.4 The Structure of Boundary Critique

The notion of boundary critique in systemic intervention (Midgley, 1998, 2000; Ulrich, 1988, 1994) addresses problematic situations with reflections on boundaries. It will be clear from section 11.3 above that consideration of a present moment implicitly assumes or defines the scope of a boundary in time. Psychologically this is determined by both the duration of attention and concern over time and the richness or variety of the content under consideration. A present moment is complex, non-linear and generative of emergent properties, including those influenced by the future (whether one believes the future is an anticipatory projection or an actuality). The boundaries of a system are defined by the limits of the knowledge that is taken as pertinent to the system in question.

In considering human systems as anticipatory systems, then, boundary critique can supply a rationale and method for supporting not only clarification of the system in question but also the present moment in which that system is being considered. Shen and Midgley (2007) in their synthesis of Buddhist thinking and systems thinking emphasise the that Buddhist systems method (BSM) does take into account the time boundary of systems under consideration.

> *"The BSM encourages the awareness of time issues because Buddhists believe we must think about, and engage in dialogue about, the past, present and future as if we live in*

> *all three simultaneously. Tomorrow's experiences can be created by today's actions, and today's actions are inevitably influenced by the past. By learning from the past, and by considering possible future consequences of our actions today, we can minimize future problems (but not eliminate them altogether because of the inevitable limitations of the human ability to grasp complexity). Here, the idea of sustainability becomes important: the potential needs of future generations need to be accounted for today."* (Shen and Midgley, 2007, p204).

The basic representation of boundary critique by Midgley is a spatial diagram (See Figure 2.1) circumscribing the domain of relevance and indicating that such a domain has a central value and identity. This is represented as the boundary of the anticipatory system. For the purposes of developing the anticipatory present moment concept, I am assuming a single boundary condition and introducing the time dimension. This slight modification to Midgley's diagram is shown in Figure 11.5. In this version the 'space' (content) of the system is represented in the plane orthogonal to the plane of the paper. The time dimension is the circle in the plane of the paper. This represents a duration with past, present and future spread over time's arrow. Thus the boundary critique takes a space and time perspective. The significance of this is that not only do we make assumptions of boundaries of inclusion and exclusion, we also make assumptions of what is relevant in usually narrow time ranges. Put simply, without a time boundary critique we may sacrifice the viable future to short term fixes.

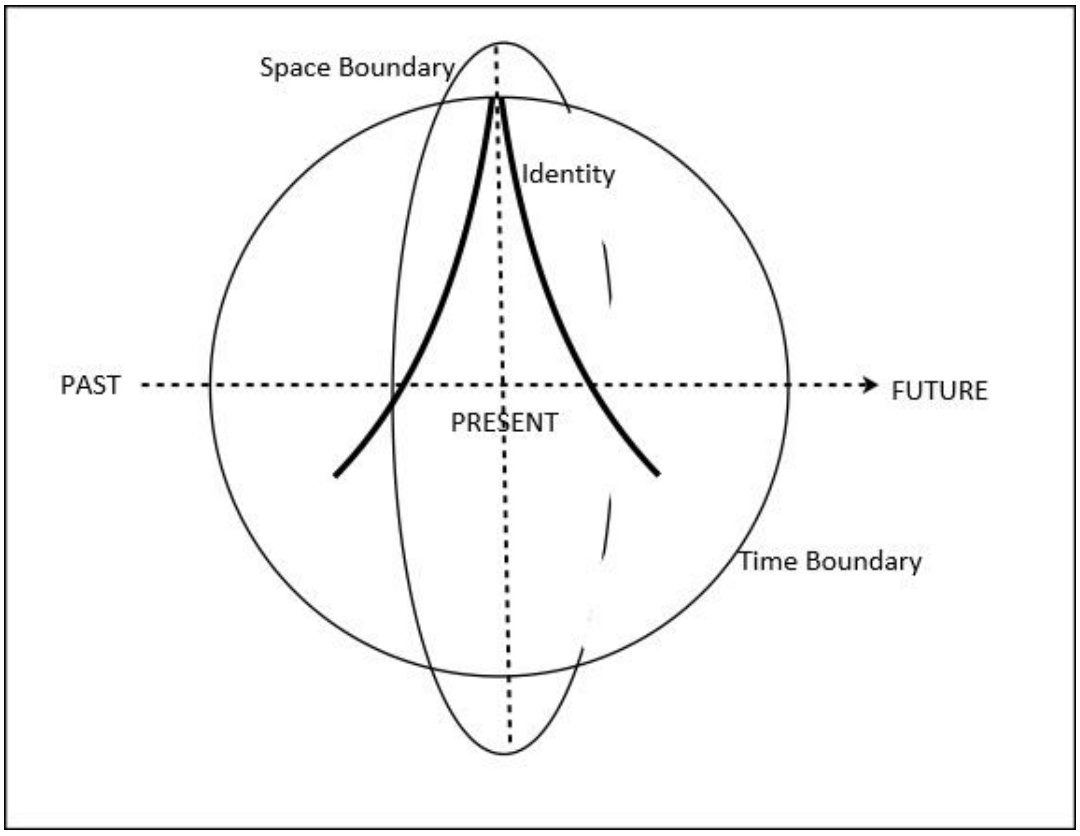


Figure 11.5 Boundary critique with space and time

11.5 Cognition and Perception

The decision maker is actually more complex than just an observer. To take a decision is to commit to some interaction with the field of the decision and 'bring forth a world'. An investment decision depends on financial resources in the decision system potentially at the disposal of the decision maker. Although observing and analysing the situation, from a systemic point of view, the decision maker is an integral component of that decision system. Markets are reflexive to the decision makers who participate in them (see Chapter 4).

Rosen (1985) makes the point mentioned earlier that, in an anticipatory system, there needs to be a feedforward loop which incorporates some view of the future which is not entirely derived from the past. We need to understand both feedback and feedforward in terms of cognition and induction. As described by Holland et al (1986) in section 9.2, the key trigger for induction is anomaly. This is the case where inductive learning is taking place stimulated by information from the past or previous experience. This is hard enough, but the challenge of induction in the anticipatory system is dealing with anomalies that have little or no basis in information from the past. Usually we are 'future blind' in this respect. Holland et al (1986) gave the example described earlier of the falling "leaf" behaving in a self-propelled way from flower to flower provoking a reinterpretation as "butterfly." But, in a world where we have never seen self-propelled plant seeds (as in the movie Avatar) how do we anticipate such and adjust beliefs and behaviour accordingly?

Stated as a paradox, the important distinction here is that anticipation needs the capacity to imagine the unimaginable and see the invisible. Entertaining multiple representations of a possible reality that has not yet happened is one way a system can become anticipatory. This is a challenge to cognitive and perceptual capabilities.

11.6 The Scenaric Stance

In section 8.1, I described Ogilvy's (2011) notion of the scenaric stance. By this he means the entertaining of multiple simultaneous scenarios of the future that may be contradictory (for example, pessimistic and optimistic) and leaving room for the unknown and the creative. This frame of mind is also clearly consistent with opening to anomaly and contradiction, which can support anticipation. To practice this we need a capacity to embrace permanent ambiguity and to put our confidence in acting in the present, but with a greatly enriched multi-dimensional experience of the present moment.

Reperceiving is necessary. This is an important link to the concept of the present moment to be further developed. It implies a reinstatement of an approach allowing for the creative openness of our experience. This orientation accords with the "open future" that is part of the present moment concept, with this future being imagined within an enlarged (or 'thick') present.

I wish here to re-emphasise several key notions which I believe must underpin any synthesis between systems thinking and futures thinking:

- multiple futures, not necessarily compatible, held in the consciousness of the present;
- openness in that consciousness to the presence of choice and creative action;
- capacity of the mind to be firm in its embrace of this openness and complexity; and
- the implications of responsibility for choice in relation to the unfolding future.

These form the bridging concept to the notion of the present moment put forward here.

11.2 The Present Moment – Time and Structure

I now propose a different way of framing the future with implications for how we practice systems thinking and future studies, whether it be in the academic sphere or in professional practice. The main focus of this thesis is on framing the ontology of the future as the ontology of the present moment. This begins with examining the question "what are the different ways that we claim to know the future?" This is the epistemological view. From there an ontological view is developed with special reference to the idea of the present moment (Hodgson, 2013), in which conventional assumptions of the nature of past, present and future are challenged. An alternative viewpoint is proposed which seeks to change our way of interpreting and perceiving the nature of the future, how it might be anticipated, and even how it may be influencing the present in ways that our conventional thinking has not been able to grasp.

As pointed out in section 6.2, a review of the language associated with futures thinking can give us some clues as to what some of the underlying assumptions are as in Table 12.1..

Word	Meaning	Assumption
Predict	framing the future in a quasi known state	The future is basically deterministic and can be extrapolated from present knowledge of conditions
Foretell	being sufficiently informed to see the inevitable, even if unusual	The future is accessible to visionary capacities in a prophetic manner
Anticipate	recognising what needs to be ready ahead of time to secure a robust decision	Consideration of future patterns can be factored into present choices
Simulate	rehearsing a gaming situation that models and reveals possible future states	The present can be structured in a way to dynamically unfold likely futures
Design	recognising that vision and initiative can bring about a different future from a current trajectory	The future is sufficiently indeterminate that we can shape it with present designs and actions
Create	having creative power combined with enterprise to step beyond convention to bring about a desired future	The future is open, thus futures can be envisioned and enacted to enable that future

Table 11.1 – Some Key Words in Futures Thinking

Rather than pit them against each other as mutually exclusive, the concept of the present moment enables all these assumptions to play a role in our experience of past, present and future. The multi-dimensionality of the present moment provides a coherent container for many different aspects of pattern and time to be accounted for. Some preparatory thoughts begin to illustrate this:

Predict – time is real and irreversible causality occurs into the present from the past and from the present into the future

Foretell – in some sense aspects of the future already exist and may be possible to see with attuned states of consciousness

Anticipate – information from the future may reach us as retro-causality or intimations of emergent patterns

Simulate – the future may unfold from the present dynamical patterns which generate future behaviours and indicate how the implicate order might unfold

Design – second-order systems have agency to shape their own future by reflexive re-entry into the present

Create – conscious actors may have the power to create new patterns that gain traction in configuring development through time

All of the above capacities in relation to the future in the present are illustrative of what the concept of the present moment needs to be able to include in order to give a coherent account of our experiences.

Reflection on Chapter 11

What began as investigating the common ground between systems thinking and futures studies led to a recognition that to attempt this within the existing assumption set of both fields would not be as interesting and fruitful as some kind of change of frame. It also became clear that this needed to go beyond reframing to the next level of up-framing or meta-framing. The research led me to selecting the six areas outlined above as the principle ideas to work with beyond the usual systems or future concepts so as to create a different context.

The six topics are not all of the same kind and play different roles. The phenomenology of time consciousness is there to ground the task in lived experience, which loosens the simple notion of linear time. This approach is further expanded by the present moment concept, which introduces a greater range of dimensionality that just phenomenology. The anticipatory system introduces a process that requires a shift from just feedback to incorporating feedforward. The anticipatory system is itself subject to reflective boundary conditions. The novelty of incorporating information of or from the future challenges existing mental structures that leads into the importance of induction and reperception.

The proposed synthesis leads to the core idea of this thesis which is *the anticipatory present moment* which is the subject of Chapter 12.

****

Chapter 12: The Anticipatory Present Moment

12.1 Bennett's Expansion of the Present Moment

The core of the synthesis takes place around the concept of the present moment and how that creates a new frame for considering the nature of system and the nature of the future. The articulation of this idea that I am drawing on and developing is from Bennett's (1966) work on the nature of time, consciousness and history, including the unfolding of the future.

The present moment is not conceived of as a static, fixed coalescence, but as a 'super complexity' (Petrov, 2010), the dynamism of which determines its ability for anticipation. Such a view also needs to incorporate a strong process philosophy to account for the internal development of the present moment and the constant flux of things in and out of the present moment. In discussing the requirements for an understanding of super complexity, Poli (2010) considers four categories that need to be considered in combination, namely: multiple levels of reality; multiple families of time and space; interactivity; and anticipation.[31]

This provides a basis to review Bennett's key notion that there are indeed different forms of time; or to be more accurate, more dimensions or determining conditions than simply space and chronological time, *chronos*. In order to account for the richness of the present moment, he considers that 'inherent patterns' or 'interconnectedness in wholes' requires a fifth dimension he refers to as "eternity". Given the word 'eternity' is often associated with an infinite amount of time, and that this is not the meaning intended here, I have chosen the Greek term *aionios*[32], referring to the essential pattern of things, without beginning and without end. But even five dimensions is inadequate to account for the diversity, variation and hazard that reveal themselves in the present moment. Bennett (1966) proposes the necessity for a sixth dimension that provides a degree of freedom for selectivity in lower levels of reality (e.g. living cells), and for choice and will at the level of our human experience. It should be noted that, although this sixth dimension can be viewed mathematically as

---

[31] Briefly:
Multiple layers of reality assumes atoms, rocks, cells, organisms, societies and so on have distinguishing features that are not simply explainable by the level below.
Multiple families of time and space refers to the relativity of space and time in relation to each of those levels.
Interactivity refers to mutual influence between entities and levels.
Anticipation refers to the capacity to take into account the future.

[32] *Aionios* has several interpretations but perhaps the most relevant is 'pertaining to the age'.
I am using this in the sense of a pattern that defines the age., i.e. age as the thick present moment. There is some value, outside of the Biblical context, to consider the words of Paul in 2 Corinthians 4:8; "While we look not at the things which are seen, but at the things which are not seen: for the things which are seen are temporal but the things which are not seen are eternal"; eternal meaning non-temporal and *aionios*.

being "out there", its primary meaning is second order and assumes a self with discrimination at the core of any present moment. He introduces the Greek term *hyparxis* for this sixth dimension, giving it the meaning of ableness-to-be. The conjecture of hyparxis leaves room for non-causal, non-deterministic creation. So, in summary, this six dimensional framework is three-dimensions of space plus *chronos* (time sequence), *aionios* (inherent timeless pattern); and *hyparxis* (freedom for creative renewal).

It should be noted that although Bennett and colleagues (Bennett et al, 1949) were involved in projects in mathematical physics to account for this framework, building on relativity theory, his interest in developing the concept of the present moment was fundamentally experiential. Therefore his extra dimensionality is different from the abstract mathematical multi-dimensionality of contemporary theoretical physics, even though unified theories do require more than a basic space-time continuum.

> *"In the 21st century M-theory advocates a unified theory of matter and forces based on 10- space and 1-time dimensions. Two-time physics envisions a greater unification in a space-time with one extra space and one extra time dimensions beyond those of M-theory. With its extra 1+1 dimensions, 2T-physics reveals hidden relationships among physical systems not captured by the ordinary formulation of physics in ordinary space-time at all scales and distances of energy."* (Bars & Terning, 2010, p7).

To represent this view of the present moment Bennett (1966) uses the convention of bracketing space and using its three dimensions to represent chronos, aionios and hyparxis, as shown in Figure 12.1. At the centre is the total set of immediate mental objects that constitute the conscious experience of the present moment. The horizontal dimension refers to the way the content of the present moment, in the form of traces, memories and expectations and hopes creates the span of time. The vertical dimension represents the latency in the form of active patterns and appearance as passive forms. The diagonal dimension, or z axis, represents what we might call living commitments entering from the past but differently from causal time. It also represents, intriguingly, influences from choices not yet made but held in mind. Earlier I proposed three time-like dimensions using the Greek terminology, namely *chronos*[33], *aionios*[34] and *hyparxis*[35] to disengage habitual associations with words like time and eternity. The concept is diagrammed in Figure 12.1.

The present moment can be related to a sense of dimensionality that is both measurable, in the sense of dimensionality in physics, and phenomenological as in the Husserlian (1903) and Bergsonian (1910) notion of duration (Hodgson 2013). These six abstract dimensions articulate into

[33] **chronos**: time on the move, time as before and after, measurable time

[34] **aiónios:** agelong, eternal pattern, unending, lasting an age, totality

[35] **hyparxis** : realised being, ableness-to-be, manifestation, capacity to bring about

six aspects of experience, namely: traces and memories; interacting commitments; passive forms; active patterns; expectations and hopes; and capacity for creative decisions.

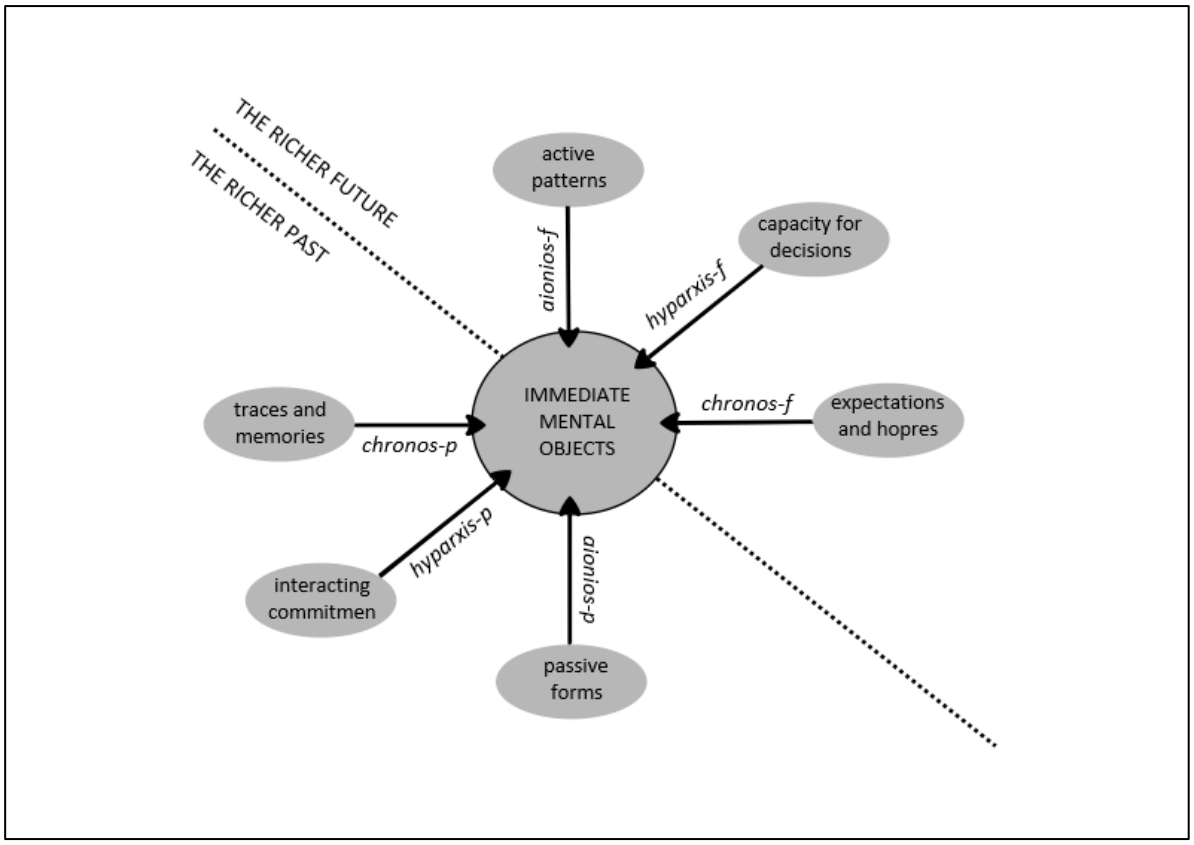


Figure 12.1 – The dimensional influences on the present moment
(modified from Bennett, 1966, p15 and p34 and developed from Figure 11.4))

Associated with the idea of dimensions of time is also the idea of the *qualities* of time. Since the common interpretation of time is so clock-bound, it is better to describe them as 'time-like dimensions'. A challenge to describing this idea comes from two seemingly contradictory prevalent views. There is the 'common sense' view, also supported by a minority of physicists, view that time's arrow travels only in one direction (from past to future). The contrasting view is that common sense time is an illusion and there is no flow (Callender, 2014). The idea of the present moment shifts from an either/or dichotomy to a both/and/ plus more perspective.

The way this particular present moment concept works is to propose that the present moment is indeed temporally constrained into an experience of now. However, each time-like dimension is an influence entering and enriching the now. For this visualisation we need to suspend the convention of time flow from left (past) to right (future) and consider the dimensions as converging to 'now' at the centre. The spatial axes x, y, and z enable us to visualise that these influences come into the present from these different dimensions. In Figure 12.1, all the arrows point *into* the sphere of the present and impact the mental experiential content. In more conventional terms, three of the incoming influences

are past-like (including linear time labelled chronos-p) and three of the incoming influences are future-like including future influencing the present (labelled chronos-f).

At the human experience level, conventional time is experienced through the traces and memories in the mind that imprint the present from the past. Retro-causality, whether imaginary or for real, is experienced as expectations and hopes. The passive form of *aionios* is the presence of relatively enduring forms. The active side of *aionios* is the vast superposition or multiple presence of possible patterns and states. The *hyparchic* past is the sense of meaningful dynamic or interacting commitments that still prioritise in the present. The *hyparchic* future is the region in which the present moment is open and evokes choices and decisions.

The articulation of the present moment concept can now be developed further. Firstly, we can see memory, interpreted as a hologram (Pribram, 1991) as a device for overcoming separateness and disorder. Memory as an immediate mental object is supplemented by traces that connect the present moment with the larger region that we call the past. Passive forms (buildings, works of art, documents and so forth) as enduring objects also connect us with the present moment. Life does not endure as objects. It must be perpetually and instantly renewed in order to maintain its existence. In Fantappie's (1941) sense, life is always seeking to privilege choice of a more complex and organising pattern from the future over degraded forms from the past. According to Vanini (2004), consideration of quantum biology leads to

> *"... a description of life which is no longer linear but circular, in which both mechanical and final causation are required. Life becomes the result of the constant interactions between causes placed in the past (diverging waves) and causes placed in the future (converging waves): the question as to whether tissues are determined by cells or cells are determined by tissues can be solved by accepting both alternatives. Life is no longer a machine, but a creative system which tends towards causes located in the future."* (Vanini, 2004, p13)

Poli (2010) points out that "*anticipation exhibits a variety of temporal patterns, from micro anticipations embedded in perception to usually longer forms of social anticipation, ranging from seconds to years and decades."* (Poli, 2010, p13). The way Bennett describes this is that existence is not confined to our own present moment. There are other present moments besides that in which we are centred. In fact present moments are nested. A larger present moment can include much of what we regard as past and future from our smaller present moment. Bennett's topology of present moments is depicted in Figure 12.2.

The present moment is a pattern of actual and latent experiences. The present moment is relative to the particular centre of experience. The latent experiences of the present moment correspond to different states of consciousness as a field of awareness of potential . The large circle represents a centre which has a relatively large consciousness and content, the greater present moment (GPM). There can be greater present moments which include and connect lesser moments. The small circles represent smaller present moments (SPM), occurring on the main time dimension. For any

scale of present moment the experience is always now. However, the GPM awareness includes both the future and the past relative to the SPM awareness. The GPM experiences the past and the future of the SPM.

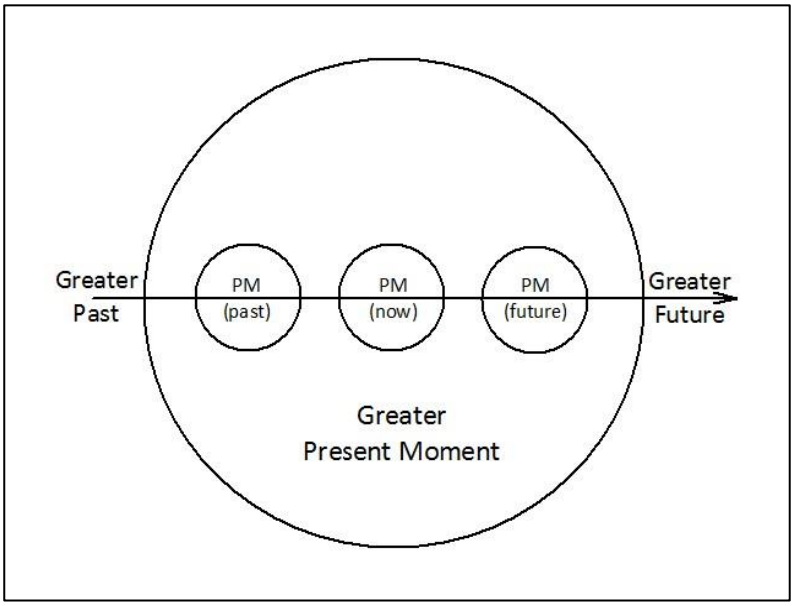


Figure 12.2 The Present within the Present (adapted from Bennett,1966, p60)

This view suggests a reframing of the meaning of, say, time span capacity (Goodman, 1967) in decision making. Decisions taken, centred in the GPM, will sustain greater foresight and greater appreciation of significant history. The point is that this capacity is not just informational but a function of the span of awareness in all the six influences depicted in Figure 12.1.

The key integrating concept proposed is an ontology of the present moment combined with the concept of an anticipatory system. The challenge of integrating systems and futures in a way that generates something of greater value for certain purposes than applying them in isolation, requires experimenting with suspension of the usual framing of either systems or futures on their own to formulate the attempted integration. Without losing the essential characteristics of either systems or futures, we need to explore a language and framing that frees us from certain constraining assumptions.

A way of summarising an initial thought framework is depicted in Figure 12.3. I use the word *pattern* as a more inclusive term than 'system' to imply a more open and emergent orientation to what is giving rise to structure in a given situation. System is treated as a particular form of pattern. The presence of pattern is also an aesthetic perception. Ramirez and Ravetz (2011) have explored the significance of aesthetics in relation to scenario processes and they refer to Bateson's (1979, p7) definition of the aesthetic as responsiveness to the 'pattern that connects'.

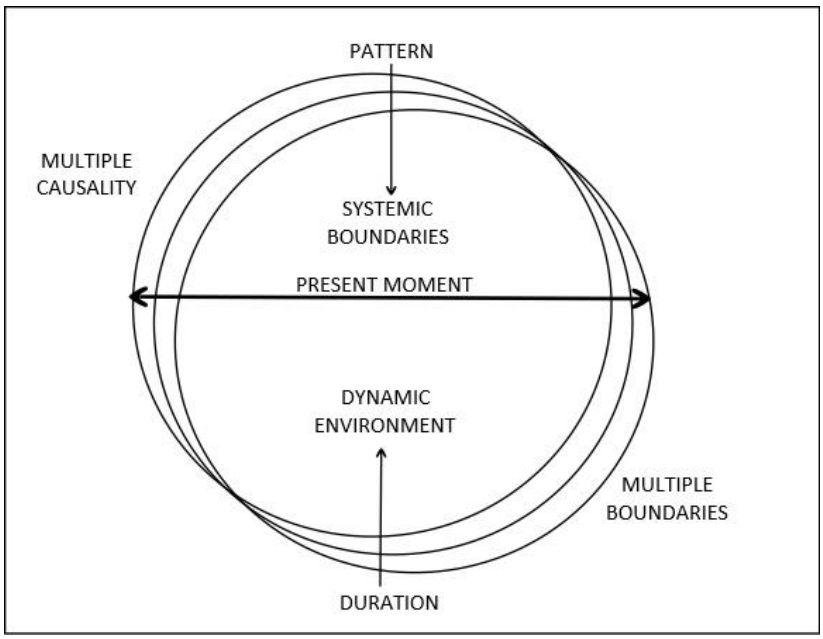


Figure 12.3 – An initial framework for considering integration of boundary critique and futures thinking

Any present moment involves a boundary and thus cannot contain the whole world. Nevertheless, the present moment is open to influence from the wider environment. This boundary is dynamic and adaptive (Emery 1980). Our current complex world, where the rate of change and intensity of uncertainty in the environment breaks the bounds of organisational adaptability beyond the Emery and Trist (1973) typology of *placid-randomized*, *placid-clustered*, *disturbed-reactive* and *turbulent-field*, forms what McCann and Selsky (1984) call a *hyperturbulent* environment.

A hyperturbulent environment challenges human organisations to maintain a purposeful present moment that can sustain the resilience needed for surviving and thriving. In Figure 12.3, the circle represents the domain of self-determined purpose. This may be individual or social (Ackoff and Emery, 1972). Since interests are complex and overlap, there are multiple circles with *multiple boundaries*. The horizontal double headed arrow labelled *present moment* is the way we describe the scope and content of the domain of interest. That is partly determined by the direct experience of *duration* and the systemic boundaries that define the domain. The double headed arrow also represents a time span of interest in the more conventional sense. The present moment is also characterised by the complex *pattern* of entities, processes and causal relationships that pertain and is also characterised by its own *dynamic environment* which is an essential concept to avoid falling into the trap of fixed images of time. Within this whole area, causality is not a simple linear property but complex and multiple. In this sense the approach echoes the notion of Aristotle of the four types of cause[36] (Falcon, 2012), which are extended to six 'causes' in section 12.3.

[36] Material cause: "that out of which"
Formal cause: "the account of what is to be"

12.2 Structure of the Anticipatory Present Moment

If the present moment contains a prospective futures then it is consistent with the idea that the future can influence the present. However, we need to be clear that the status of both the present and the future are not the same in this context as in the conventional time line of past, present and future. In this alternate view, the key framing is a topological one of the containment of different scales of present moment which means that what is present in a larger present moment can be in the future of a smaller present moment. This is reminiscent of the fashion in futures thinking some years ago to talk about "pockets of the future in the present" (Toffler, 1970). This notion has pragmatic value in searching for early indicators of change, but in the context of present moment theory may have deeper underpinning significance.

Ontology of time in philosophy has been largely concerned only with an ill-defined instant or with the timeless 'eternal now', although recent interest in the philosophy of futures and anticipation is significantly opening up the subject (Poli 2011). We need an ontology of all present moments, including past and future states. What exists for us is our present moment, and this can be different according to the state of our consciousness. The present moment is an interception of the six influences in Figure 12.1, which range over the existing and actualising worlds to the worlds of will and value which have more degrees of freedom than the basic space-time continuum.

In the ordinary way, experience is of that which is now being actualised, namely the content of the present moment with its traces of the past and expectations of the future. Within the personal present moment, freedom is limited by the commitments of the past and latent patterns of potential. These have the effect of turning the present moment into a conditioned state in which the self has little power of choice. It is, however, possible to transcend this conditioning by abandoning attachment to the current content of the present moment and thereby entering a larger present moment with more degrees of freedom.

In systems thinking this self-determination of the present moment adds a new perspective for looking at boundary critique. Midgley (2000), for example, points out that conflicts arise from overlapping but not congruent stakeholder concerns. This might also be represented a boundary distinction in the present moments of the stakeholders. Conciliation may require an expansion to a higher degree of inclusiveness of the other to form nested present moments in a greater present moment. This is inextricable from the consideration of conflicting values as well as boundary judgements (Midgley and Pinzon, 2011). A representation of boundary considerations to the present moment was shown in Figure 12.3.

Efficient cause: "the primary source of change"
Final cause: "that for the sake of which a thing is done"
From Stanford Encyclopaedia of Philosophy
http://plato.stanford.edu/entries/aristotle-causality/#FouCau accessed 28/10/2015

The present moment of the system is represented by the circle. Several circles, slightly displaced, indicate that there are multiple systems with differing present moments that share a common overlap. The duration of the present moment is represented by the diameter of the circles. The boundaries of the system, in a reflexive sense, are congruent with the boundaries of the present moment. Each present moment carries a latent pattern that is influencing its behaviour. In the context of the present moment the influences are multiple in two senses. In the first sense each present moment has its own rich texture. In the second sense each present moment is subject to the six influences depicted in Figure 12.1. All of this represents a dynamic internal and external environment which may be nested in larger present moments as depicted in Figure 12.2. Relating boundary critique to the notion of the present moment is tackled in more depth in Chapter 14.

In present moment theory the future exists: but it does not exist within a small conditioned 'thin' present moment. It exists in a greater 'thick' present moment. Our future is not-yet-now for us, but it is already present. We cannot say that the future is "in" the future in a linear sense. What we can say is that an event that will occur in our future is already present in a larger present moment. The notion of present moment also implies sentience. This may be of differing degrees depending on the level of reality in focus. My interest here is in the sentient of the human level which is characterised by reflexivity. This brings me back to Vickers (1983) point that human systems are different and have the capacity to reflectively appreciate. Appreciation is another lens through which to interpret the present moment. My proposition is that in the human system, appreciation is a key aspect of anticipation.

So to recap from Chapter 11 my key notion is that systems and futures can be viewed integrally through the notion of an *anticipatory present moment* (the APM). This has a complex structure that integrates the six themes for integration. The APM:

- Incorporates the phenomenology of time experience
- Adapts a scenaric stance towards the future
- Is structured according to the principles of anticipatory systems
- Is embedded in the ontology of the present moment
- Acknowledges the second-order nature of boundary critique
- Is open to meta learning through varieties of reperception

This level complexity requires a diagram, shown in Figure 12.4, to bring it together and show the interrelationships.

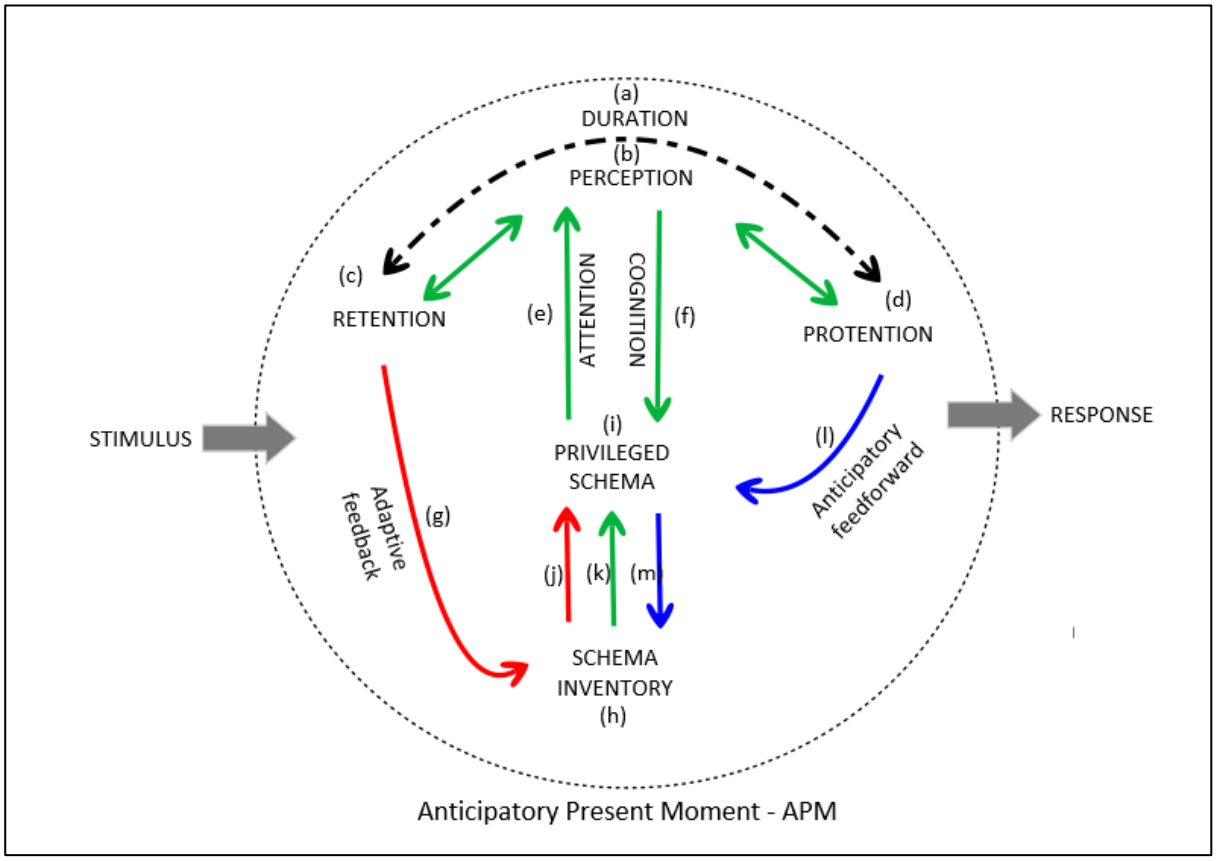


Figure 12.4 The Anticipatory Present Moment (APM)

In Figure 12.4 the circle represents the scale and extent of the present moment in question. It also represents the selection or identification of the relevant boundary conditions. The stimulus entering the circle on the left represents the influences of conventional causation from the past of this particular present moment. The response exiting the circle on the right represents the influence of the present moment in question on future conditions. The present moment in question is recognised as the experiential or phenomenological aspect of the self-agency at its centre. This self is taken to include a cognitive anticipatory system represented by the components within the circle. The alphabetical tags reference components of the diagram to the descriptions below the diagram.

a) Duration – the fundamental experience of time consciousness
b) Perception – what is seen to be present
c) Retention – the active retrospective present
d) Protention – the immediate sense of the future
e) Attention – the direction of interest
f) Cognition – the mental sense making of the moment
g) Adaptive feedback – adjusting to information from previous experience
h) Schema inventory – the set of mental interpretations available in the mind
i) Privileged schema – the selected interpretation of the moment

j) Promotion of schema from past – recovery from previous history
k) Promotion of schema from present – immediate interpretations of current 'reality'
l) Anticipatory feedforward – alertness to information from the dimensions of the future
m) Promotion of schema from future – innovative interpretations not extrapolated from accumulated experience – the anticipatory difference

Figure 12.4 summarises a model for an integrated understanding of systems and foresight through the proposed structure of the anticipatory present moment (APM). This model also can serve as the basis for reflexive decision-making. The APM thus incorporates the six threads mentioned in Chapter 11, namely: the phenomenology of time experience; the scenaric stance; the ontology of the present moment; boundary critique; the nature of anticipatory systems; and the nature of induction and perception. The APM concept has more to it than simply the addition of these six factors; they have a dynamic interrelationship as depicted in the diagram.

Beginning with extended boundary critique, the dotted circle represents the boundary of both the system in question and the duration of the present moment. The notion of boundary critique is extended from the boundary of system space to include timespan, but more than that, the span of all six dimensions of the present moment. The line is dotted to symbolise that the present moment system boundary is permeable to influences from a greater present moment within which it is contained, and also subject to the judgement of the reflexive agent or subject at the heart of the system. So the concept of present moment contributes to framing the definition of the APM.

The phenomenological aspect of the APM is the experience of duration (a) which depends on the attention (e) and cognition (f) of the reflexive subject. Duration is the experience of the present as having more to it than simply the knife-edge instant between the past and the future. Attention (e) is the capacity to direct and sustain interest in the present event (Ingold, 1999). Cognition (f) is the capacity to configure and interpret the experience.

An important consideration here is the attention span of the subject. Husserl (Gell, 1992) considered this in terms of listening to a musical note lasting a matter of seconds differentiating the direct experience of hearing the sound into retention as distinct from memory and pro-tention as distinct from imagination. The APM extends this to the range of factors in both past and future in the dimension of *Chronos* that the subject can sustain. In conventional terms, this can be related to time-span capacity (Jacques, 1956). In the context of systemic intervention, this span relates to the intended scope of improvement which in conventional terms is characterised as short, medium or long term. Perception (b) is the engagement in the experience by a conscious self. Retention (c) is the presence in experience of temporally recent aspects of the currently ongoing event; note this is not the same as the reproduction of the experience in memory. Protention (d) is the counterpart to retention in the

experience of anticipation of the currently ongoing event; note this is not the same as the imagination of a future.

Research into time and brain structure sheds some light on this at the neurobiological level but the field is still unresolved. The APM implies that the time experience can range beyond the short intervals of neural impulses. The situation is summarised by Damasio (2014):

> *"…mind time has to do with how we experience the passage of time and how we organise chronology. Despite the steady tick of the clock, duration can seem fast or slow, short or long. And this variability can happen on different scales, from decades, seasons, weeks and hours, down to the tiniest intervals of music – the span of a note or the moment of silence between two notes. We also place events in time, deciding when they occurred, in which order and on what scale, whether that of a lifetime or of a few seconds."*
> (Damasio, 2014, p42).

In the structure of APM, the first cybernetic dynamic is the adaption to feedback (g), which is the learning cycle of adaptation. This, in itself, is not anticipation but is essential for a viable system. Adaptive feedback is the capacity of the experiencing conscious self to take heed of and adjust behaviour to what has recently occurred within their present moment

The APM structure includes the capacity to learn from past experience. This can be seen as information, $\mathbf{i}_{\mathbf{past}}$, as coming from the retention side of duration, which in conventional terms is characterised as adaptation, learning from history. The APM also includes the capacity to receive information from the protention side of the present moment, $\mathbf{i}_{\mathbf{future}}$., learning from the future. This information contains elements which cannot be derived from the past. Nevertheless, in most current thinking about the prospective capacities of mind and brain (see, for example, Seligman et al, 2013), which does not yet acknowledge the possibility of the future influencing the present (e.g. retro causality), $\mathbf{i}_{\mathbf{future}}$ is considered to be some novel rearrangement of existing $\mathbf{i}_{\mathbf{past}}$.

In the APM this form of generating the $\mathbf{i}_{\mathbf{future}}$ is not excluded but the dimensional structure of the present moment leaves open the possibility of authentic retro-causality, new patterns revealed from space-*aionios* (in Bohm's,1980, language, from implicate to explicate) and creative emergence from space-*hyparxis*.

As an anticipatory system, able to incorporate both past and future into current choice, the APM requires the intelligent flexibility of induction and re-perception. Any reflexive mind has a repertoire or inventory of schema or mental models that inform behaviour at different levels. Schema inventory is the repertoire of cognitive interpretations that are available to the conscious self. The term schema refers to some organised pattern of thought or mental model that organises categories of information and the relationships among them. The term was given prominence by Piaget and taken up by von Glasersfeld (2001) in his radical constructivism. The role of schema in induction by Holland et al (1986) has already been discussed in Chapter 9. The role of schema in sensemaking also features in Weik's theory (Weber & Glynn, 2006). Schema should not be understood as equivalent to blueprints within the mind that are in some way implemented. The situation is far more dynamic and

plastic than that. I have come to the view that cognition is neither wholly schematic nor wholly interactive, but some hybrid of the two. The plasticity of the brain (see Section 5.3 regarding the recently discovered default network) seems to be constantly active with its inventory of schema as well as enacting, through the equivalent of simulation, much wider possibilities than those currently manifest. In the APM diagram this is represented by the relationship between the schema inventory (h) and the privileged schema (i) in action at any particular moment, selected as appropriate.

In behaviour which is principally adaptive, the privileged schema will be part of an existing historical repertoire which may well be applied in a novel way, but is essentially based on past experience. In behaviour which is anticipatory, the privileged schema may emerge from a shock factor which has invalidated the current repertoire as ill-fitting and inappropriate. Privileged schema are the automatically or consciously selected schema that are dominant in the current interpretation. We can suppose from this model that any authentic anticipatory behaviour is always arising from some anomaly that challenges the habitual way of responding to situations or taking decisions that have strong implications for the future. These anomalies may come in several forms. The most obvious is when, in a scenario planning exercise, the reflexive decision-making sees propositions in a scenario that contradict his or her current strategic assumptions and therefore indicate possible future failure if not taken into account. If these scenario propositions are taken seriously enough, then a crisis of reperception is triggered. This is a non-trivial event since it almost certainly will also trigger psychological factors like denial and defensive routines (Argyris & Schon, 1978) as well as entry into new opportunity space.

However, there can be internalised forms of anticipatory reperception that emerge from a more intuitive source. This can be observed externally in fields from competitive sport to entrepreneurial enterprise. A player in a ballgame may have an uncanny capacity to be ahead of the game in just the right spot to make winning moves. An entrepreneur may have a hunch that something unbelievable will work against all conventional wisdom, risking with confidence seizing an opportunity overlooked or dismissed by others.

So in terms of the APM diagram, the pathway (g) → (j) represents adaptive behaviour that determines attention (e) and perception (b); the pathway cognition (f)→(k) represents the mainstream of choosing how to look at the situation; the pathway anticipatory feedforward (l)→(m) represents the way additional degrees of freedom become available to the APM. (m) is the enrichment of the schema inventory by the learning brought about by anticipatory feedforward, which would not occur reliant on only adaptive feedback.

REFLECTION IN THE PRESENT MOMENT OF THIS WRITING

The following reflection was generated in 'present time' examining my experience through the lens of the APM model. The purpose was to try out in my own consciousness the effect the structure of the APM might have to guide a reflection. Also, I hope it helps the reader link the abstractions with observed experience in the spirit of second-order science.

The focus of this exercise is the present thinking and writing of this thesis. At the time of this specific writing I'm in the centre of writing the dissertation. It is far from complete and yet is becoming clearer as I continue my reflections. That which is already written up to this point is clearer than that which is yet to be written, for which rough incomplete possible material has been assembled. I want to see how this looks and feels through the notion of the structure of the anticipatory present moment.

Where do I mentally draw the circle; the wholeness of this present moment? In terms of this version of the document, I have been working on it on and off for nine months. In terms of the formal research I have been focused on this for about three years. In terms of many of the key ideas, they began over 50 years ago. In terms of completion in the future, formally I have about two years left; in terms of communicating the ideas, that might rise to 10 years. If my present moment were to reach into the future as far as it is drawn from the past, then this thesis may have another 50 years of life in it way beyond my personal life span. What to focus on?

The duration, which has immediacy for me, feels like about six months. Thoughts that were active three months ago have the feeling of being alive in my mind, not simply memory, and thus in the space of retention. Similarly, although the completion of this work in many ways is open and fuzzy, I have a feeling of a clear outcome that will shape itself over the coming three months. This feels like protention rather than imaginative fancy or wishful thinking.

In reviewing the earlier chapters, written in an earlier time period, I have been experiencing critical signals as to their lack of clarity, omissions, need for further illustrations, etc., which constituted feedback into the present from work already done. This piece of writing taking place here was not in any plan until yesterday when it struck me that it would be incomplete and even inconsistent to explain the model of the anticipatory present moment in simply a first order way. It needed itself to be an exercise in reflexive systems thinking and anticipation. My conventional mind tells me that this activity is simply a further piece of feedback from something that occurred yesterday. My anticipatory mind senses that this reflexive approach is far more significant than I'm appreciating, centred in this present moment, and that by the completion of the writing new implications will have emerged. This feels to me like anticipatory feedforward.

Leading up to this present moment has been an accumulation of concepts, information and experience which have enriched the inventory of the mental models or schema that are available in

my mind, and a reference in my personal library and wider fields of reference. Most of this inventory has accumulated from my past experience and enquiry. However, when I set out on this task prior to this reflexive present moment, I did not contemplate or have in mind that the notion of the present moment would either be in the thesis or particularly occupy such a central position in the conjecture of synthesis. It seems so obvious now that this present was in some way influencing the scope of my mental inventory and particularly which schema have come to be privileged in my current perception and understanding. This change has involved hours of concentrated attention and several crises and excitements of reframing and reperception.

The challenge to sustain and continue this work in the present is to hold all this together in my mind and feelings. Can I sustain this present moment as it unfolds its future?

[Note to the reader: This section was not written or edited retrospectively but is exactly as it was experienced before the remaining chapters were thought out and written.]

12.3 APM as a Meta-Framing Concept

The anticipatory present moment concept, combined with the dimensionality of the present moment, give us an entirely new way of looking at existing systems and futures methods. They will be applied in an interpretive manner to see what additional insights they bring out of a selection of existing methods. The notion of decision integrity will be further reviewed in Chapter 13. Chapter 14 will concentrate on the three areas indicated in Figure 3.1, namely: dilemma resolution; the viable systems boundary critique; and a world system model. Chapter 15, appreciating the future, will do likewise in considering the strategic foresight method of three horizons.

This stage cannot in any way be a comprehensive exercise in meta-framing of the vast range of concepts and techniques in the system sciences. Rather, it is a reflexive experiment to explore the potential of this approach arising out of the work to synthesise systems thinking and futures thinking.

The APM as a meta-framing method requires two concepts to be applied. The first I will call *dimensional framing* and the second *anticipatory dynamic*. Dimensional framing is based on the six dimensions of the present moment described in section 12.1, above. Anticipatory dynamic is based on the structure of the anticipatory present moment described in section 12.2, above.

These two meta-framing methods share a common present moment represented by the circle in both diagrams. The nature and scope of this present moment will be determined by the subject, observer or decision maker for whom it is relevant and, since the present moment is open, with interaction within the wider decision system.. The following depictions imply the presence of the observer who is implicit in there being a present moment. A more explicit account of observer presence will be given in Chapter 16, on the mindful practitioner.

It is interesting to reflect on the implications of multi-dimensionality on the notion of causality. In the context of a singular dimension of linear time then we define causation as an

influence coming from the past to bring about the present, and influences in the present causing the future. The Aristotelean idea of four kinds of causation invokes a richer dimensionality. (See Footnote page 154) However, if we broaden the notion of causality to imply primary influences that shape the present moment then, to be consistent with our three dimensions of time, each with a different relationship to the present, we could postulate six forms of causality as defined in this way.

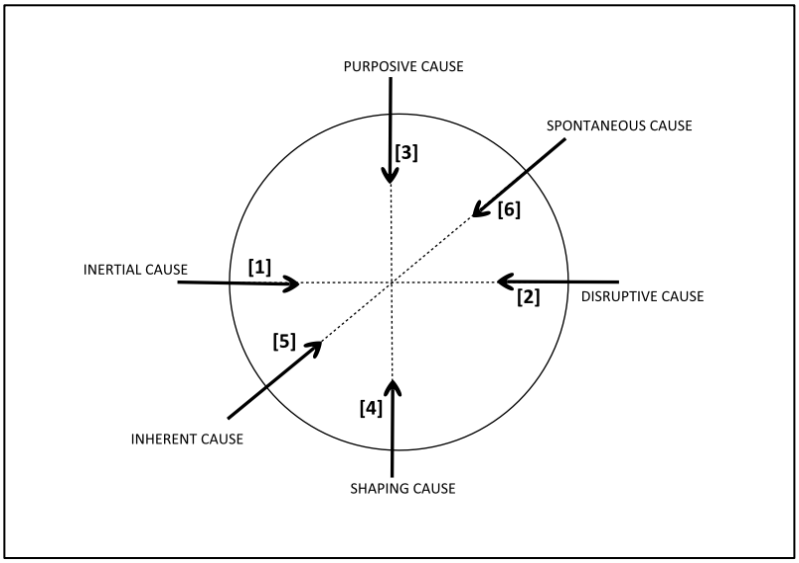


Figure 12.5 – The six fundamental causes

The diagram in figure 12.5 shows an extension of the Aristotelian four causes to six, corresponding to the six time-like influences on the present moment. Note that all the arrows are pointing *into* the circle of the present moment implying a source of influence. Note especially that the horizontal line is therefore not a conventional 'time's arrow' going all the way from left to right.

Figure 12.6 shows the dimensional structure as six simultaneous influences on the present moment. The circle represents the present moment of interest in which the subject or observer is participating. This diagram is populated with questions based on the above six causes (influences) and therefore opens up a structure that invites inquiry. In this way the theoretical framework suggests a development of practice. This provides a basis for the experiments reported in Chapter 16.

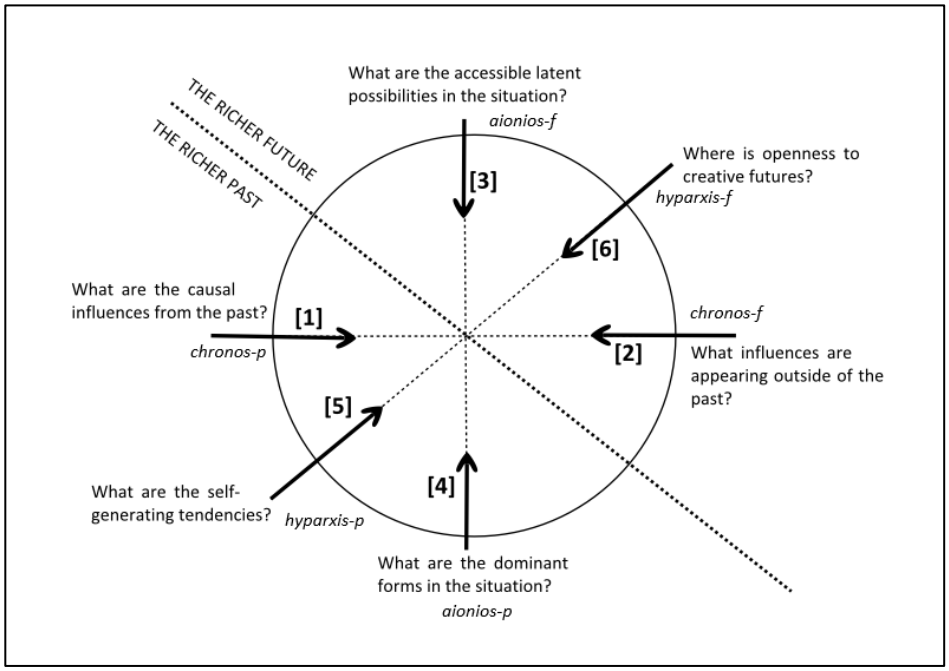


Figure 12.6 Dimensional Framing Tool

Questions [1] and [2] are on the chronos or linear time dimension. Question [1] is essentially asking in the most obvious way how did we get to be here? Question [2] is unusual in that we are asking if there is anything new and surprising in our intuitive scanning of the future that seems challenges our answers to question [1].

Questions [3] and [4] are on the *aionios* or pattern dimension. Question [3] is directed towards appreciation of the latent possibilities in the situation. It is essentially tuning into the potentiality of the present moment. Question [4] is directed towards the manifest and tangible conditions of the situation. 'Forms' differ from 'potentialities' in that they are directly perceptible to the senses.

Questions [5] and [6] are on the *hyparxis* dimension. Question [5] is directed towards appreciating what might be called the 'living past' of the situation; its tendency to perpetuate itself adaptively rather than simply linearly, as in question [1]. This aspect can be related to autopoiesis, (Maturana & Varela, 1987), in this case the self-making of the present moment. In complexity terms it might be related to a dominant strange attractor, which creates current patterns through multiple present moments. Question [6] is the question which, by its very nature, has no obvious answer since it is pointing to the creative space of spontaneous arisings in the self or in the world. In complexity terms it might be related to emergent properties of the present moment, but I do not feel this would be a complete account of its nature and significance.

The diagram in Figure 12.7 shows the pattern of the anticipatory present moment that structures its dynamic.

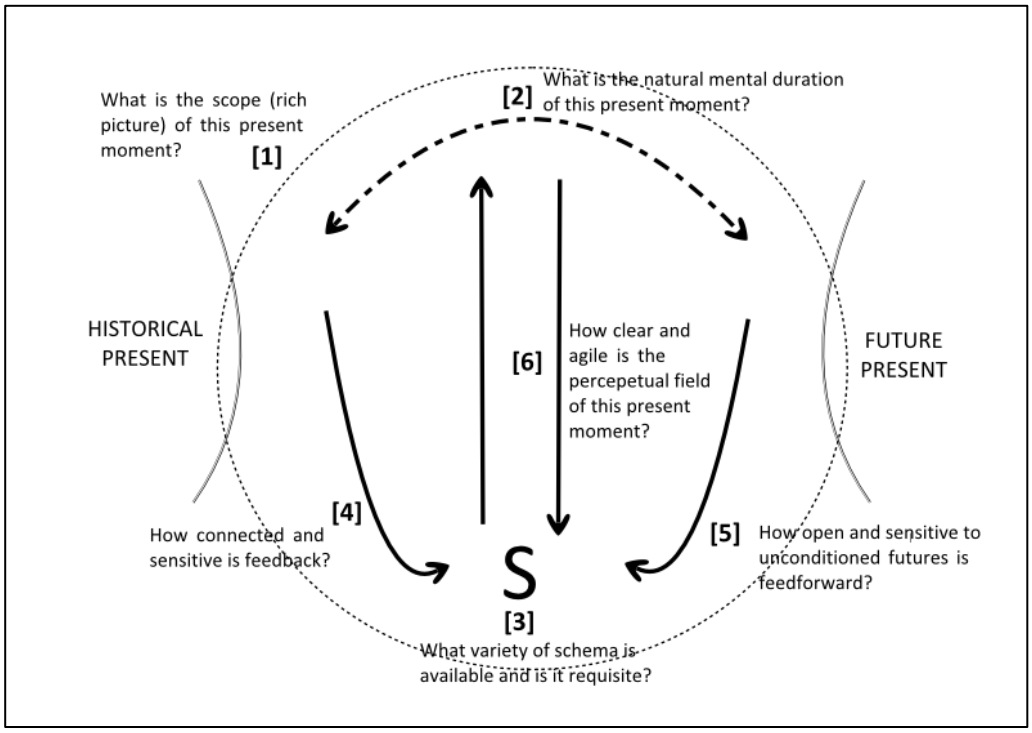


Figure 12.7 Anticipatory Dynamic Tool

The dotted circle represents the present moment as in the dimension framing tool. However, this diagram represents, in highly distilled form, the essential structure of the anticipatory present moment as a set of reflexive questions. Again the observer for whom this is a present moment is implicit in this account.

Question [1] concerns the scope of the present moment. The simplest way to identify and talk about this is to use the limited uni-dimensional equivalent of time span. In this sense the present moment may be measured in minutes, hours, days or even years. However, the scope includes the content of the present moment and is more like the equivalent, say, of a rich picture in soft systems methodology (Checkland & Poulter, 2006). Question [2] concerns the duration of the present moment. This may seem identical to the time span in question one, but we link this with the deeper psychological and phenomenological aspects of retention and protention as described by Husserl. This distinguishes it from a time span measured by memory and imagination, or simply by the clock.

Question [3], associated with the capital **S,** concerns the variety of schema available for deployment. As we saw in the section on induction, a limited repertoire of schema will limit the capacity to grasp the present moment. Echoing the principle of requisite variety in cybernetics, the question is also examining whether the repertoire is up to the task or decision at hand. A good

example of this is in scenario development work where a wide variety of interviews in a wide variety of disciplines and backgrounds increases the chances of relevant coverage in the scenarios.

Question [4] concerns the presence and effectiveness of adaptive feedback. In this present moment, is there learning from experience? This requires appropriate connectivity to sources of information and appropriate sensitivity to their significance. This also includes the process of sense making.

Question [5] concerns the crucial distinguishing factor in an anticipatory system; that is, feedforward. This is the capacity in the present to attune to influences from other dimensions than linear past to present time flow. I postulate, from the dimensional framing model, that this can include retro-causality, latent pattern and open creativity.

Both feedback and feedforward need to impact the schema repertoire **S** and challenge extension and development to meet new circumstances. This is also an aspect of resilience. Question [6] is about the perceptual field of the subject or observer, processed through attention, cognition and affect. It relates to the ever moving dynamics of all of these interactions within the present moment. In simple language, how awake is the subject? This will be further addressed in Chapter 16.

There remain two overlapping arcs. These represent, on the left side, the historical present (the previous present moment) from which this one has emerged; on the right, the future present (the next present moment) which will emerge from this one. Not represented on the diagram is a large circle embracing all three, which can be called the greater present moment within which these are nested; a concept easier to grasp in a six dimensional continuum rather than a four dimensional space-time continuum (see Figure 12.3).

In the following three chapters, I will use the dimensional framing and the anticipatory dynamic to bring new interpretations of the significance of six areas of practice in systems and futures.

Reflections on Chapter 12

The formulation and communication of the concept of the anticipatory present moment plunge me into the core of my investigation into second-order science. This reflection now needs to go further than the interim reflection in the highlighted box. A test will be to relate how the six questions in Figure 12.8 are operating in my present moment as I write this:

1 What is the scope (rich picture) of this present moment?

There is an effort to bring to mind the six ingredients that are synthesised in the anticipatory present moment.

2 What is the natural duration of this present moment?

The duration feels like a retention of these six aspects as subliminal mental images that are energising my effort to stay in this present moment. A secondary aspect of duration is the

background playing of a clarinet concerto which presences the sense of duration populated by the whole pattern of the composition that is playing out loud. It also feels like a protention that there is an as yet unmanifested closure on this exercise.

3 What variety of schema is available to me at present, and is this adequate?

This question brings to mind a journey of the last three years researching this field in an even larger present moment of pretty much five decades of emergent interest in arriving at an understanding of time, pattern and perception. The dilemma faces me regarding the boundary conditions of requisite variety: when is enough enough? Perhaps the vehicle of a doctoral thesis provides a container, supporting my choices of inclusion, exclusion and boundaries of ignorance.

4 How connected and sensitive is feedback at this moment?

The way I seem to experience this is a sense of convergence of the variety of ideas and information in the work to this point. The convergence aspect is that much has been reviewed from past work through reading, discussion and questioning.

5 How open and sensitive to the unconditioned future am I?

This is the key anticipatory question which seems to reveal itself as another dilemma. In writing this document there is a step to closure that appears to contradict an open future. On the other hand, much of the work raises more questions than it answers and therefore invites an as yet unrecognised or unarticulated future to unfold. It is also reflected in hope that some of material will trigger other avenues of research for other people.

6 How clear and agile is the perceptual field of this present moment?

The last movement of the aforesaid concerto has joyous lilt that resonates with the feeling that the ideas are dancing in my mind and promising further unfolding as I write and review what remains in the final chapters, especially the most open chapter 16. This will be a test of agility in the final duration to completion.

****

PART FOUR – Implications for Practice

Chapter 13: Decision Thinking Re-examined

13.1 Anticipatory Decision Making

I am interested in exploring the connection between decision-making, the future and anticipation. Any decision implies an engagement with the future. The point of a decision is to make a choice *now* that has an effect on how future conditions will turn out: an investment is made to get a return; the choice of holiday is the future refreshing experience; a choice of partner is an anticipation of a future relationship. In a world where things are reasonably stable and prediction can be made reliably, then working out that future gives some stability to making the decision. In even the complicated world of decision analysis, this is likely to be helpful. However, in the world of complexity, there is too much uncertainty for prediction to be reliable (Snowden and Boone, 2007). There are likely to be difficult to anticipate shifts of pattern.

This Chapter draws on earlier work in this area (Hodgson, 2010) before the idea of the anticipatory present moment (APM) was developed. The stronger emergence of second-order science and rekindling of interest in anticipatory systems thinking of Rosen (1985) coupled with reflexive perspective of APM enables a further development of the idea of decision integrity which is, essentially, a second-order concept.

Various disciplines have been brought to bear on decision making. One major field is that of the decision sciences. However, the decision sciences (Bermudez, 2009; Goodwin and Wright, 2010), tend to take the first-order paradigm and use analytical methods in which some form of multi-factor calculation generates the optimum taking into account multiple criteria. In the management development field the subjectivity of the decision maker is considered as a cognitive skill.

. Heirs (1986) made the case for decision thinking as a distinct branch of thinking in which an executive precedes any decision by a piece of well-constructed, imaginative and rigorous thought. This was about going beyond automatic habitual thinking, and in practice introduced a reflexive discipline. The executive has to pay attention to his or her own thinking process in arriving at a choice. This process has the basic stages of (a) clarifying the question, (b) developing alternatives, (c) anticipating the consequences, and then (d) making the decisive choice. This cognitive approach does not seem to have caught on beyond the confines of the consulting world, and the terminology and approach of decision making became more concerned with analysis and the development of the largely first order decision sciences. In the world of operational research, decision thinking was subsumed into the sub-discipline of problem structuring methods (PSMs) (Rosenhead & Mingers, 2001).

Although the term 'decision thinking' does not seem to have been used in relation to problem structuring methods (PSM), the two fields have many similarities. For example, the method of analysis of interacting decision areas (AIDA) has four stages of shaping, designing, evaluating, and choosing, much like decision thinking. This developed into the strategic choice approach. (Friend and Hickling, 1997). This approach has some similarities with soft systems methodology (Checkland, 1981) in that it endeavours to make visible interconnecting sets of assumptions.

Shifting to a new pattern requires some form of strategic thinking and foresight (Miller 2007). I will describe the various disciplines of foresight and futures studies using a framework introduced by Sharpe (2008). Foresight can be classified into four types according to the extent to which the decision maker has agency to do things and the degree of uncertainty they are facing in their decision field. By agency we mean the power to influence or shape the wider environment. This distinction classifies four basic modes of futures methods, as shown in Figure 13.1.

If the decision maker has relatively low agency, for example when planning in a going concern, and the operating environment is relatively stable and certain, then the classical methods of forecasting followed by resource planning in relation to those forecasts can be effective. These methods generally assume a predictable world where, for example, the measurement of past trends can be extrapolated into the future without any problem arising. The limitation of these methods is that they assume the continuity of a fundamental pattern with perhaps minor incremental changes. Innovation based on this will tend to be reinforcing or rescuing the status quo.

If the decision maker has high agency in a relatively stable and certain operating environment, as for example when implementing the rollout of a proven technology enterprise (MacCoby, 2009), then the method of road maps (Kostoff and Schaller, 2001) into the future applies. Galvin (1998), the former Chairman of Motorola, summarises their nature and role thus:

> *"A 'roadmap' is an extended look at the future of a chosen field of inquiry composed from the collective knowledge and imagination of the brightest drivers of change in that field. Roadmaps communicate visions, attract resources from business and government, stimulate investigations, and monitor progress. They become the inventory of possibilities for a particular field. In engineering, the roadmapping process has so positively influenced public and industry officials that their questioning of support for fundamental technology support is muted."* (Galvin, 1998, p803).

If the decision maker has relatively low agency but faces a very high level of uncertainty, then the method of multiple future scenarios applies. The origins of scenario planning in Shell illustrate this (Wilkinson and Kupers, 2013). Although Shell is a massive international company, its size and impact relative to the total energy market and the geopolitical context of energy indicates that it has relatively low agency compared to the scale and power of its global context. Also, the uncertainties over a 20 to 30 year exploitation time span surrounding the geopolitical and geological conditions necessary for economic oil extraction and refinement are considerable. The basic scenario method

researches these uncertainties and distils them down into several alternative possible futures. These are not forecasts, and nor are they roadmaps of action pathways to be taken, but rather they are narratives of possible future conditions based on the imaginative interpretation of a wide range of information. Their application in strategic thinking is sometimes referred to as 'wind tunnelling' (van der Heijden, 2005), in which the strategic direction of the company is tested for robustness in more than one potential future.

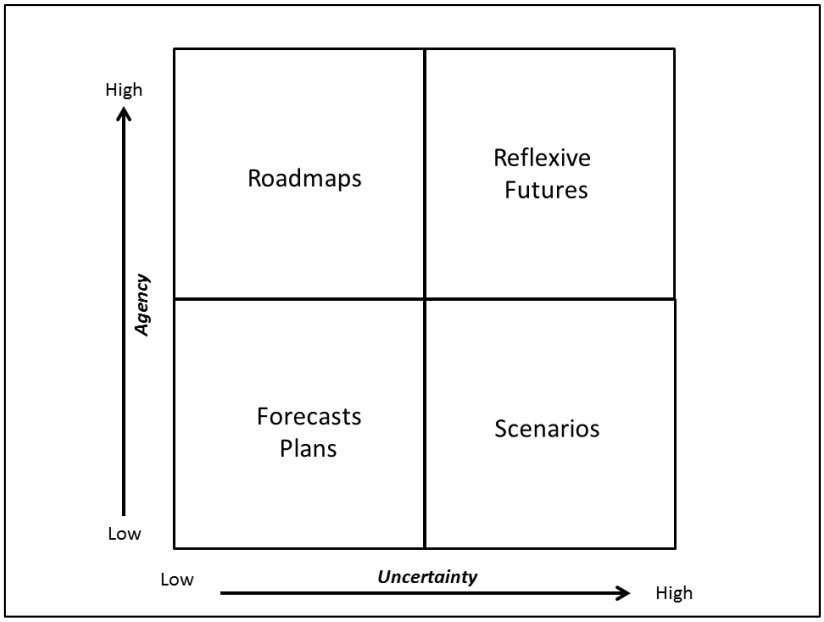


Figure 13.1 – Four Broad Categories of Foresight Method (after Sharpe, 2008)

However, the range of concepts and practices associated with the term 'scenarios' has greatly enriched since scenario planning was first launched in Shell around 1970 (Wilkinson and Kupers, 2013), and certain aspects would now appear in all four boxes. Bishop et al (2007) propose a classification of scenario methods based on eight kinds of technique. Van Notten et al (2003) position methodologies according to the ways in which they treat project goals, process design and scenario content. Yet another approach is that of mode-level analysis proposed by Voros (2006), which is based on a set of thinking modes combined with a series of interpretive levels to analyse prospective methods in terms of which mode(s) and what level(s) they operate with or at. Cross-referencing the dimensions of agency and uncertainty as proposed by Sharpe (2008) and portrayed in Figure 2, brings yet another perspective.

It is interesting that, in the foresight disciplines, there is still relatively little methodology for the fourth box where both agency and uncertainty are high (Harkins and Morovec, 2011; Grim, 2013), and yet this is the area which is increasingly the operating environment for government, commerce and society more generally. One expression that describes this fourth area is 'reflexive futures'. This might also be characterised as strategic exploration. The high agency component of the decision

making is reflected in a practice of setting a strong vision of a future state of affairs in which the actor is occupying a desired position (much as Ackoff, 1981, recommends in his Interactive Planning systems approach). The uncertainty component of the decision making is treated in qualitatively different time zones, each with its own dynamic. By qualitatively different we mean features like the differences between predictive, transformative and emergent ways of framing the future. In this way the decision maker is operating in an expeditionary mode where progress is made according to current knowledge but strong feedback is incorporated into adapting any decision to match the emergent circumstances rather than simply 'push it through'. 'Reflexive futures' implies adaptive strategy and adaptive leadership (Pascale, 1999).

So although multiple structural anticipatory scenarios can help create mental conditions for revealing the hazards, they can only deal with the framing of decisions in one context. The complexity of this challenge usually results in decision makers, having engaged with the decision field as a set of scenarios, then reaching for the familiar tools of decision analysis, which inappropriately assume low uncertainty. In reaching for rules to give them the answer (say the 'optimum' or their usual assumptions) they collapse the benefits of the scenario work. The fundamental incongruence between the complex uncertain nature of the decision field and the assumption limited algorithms of the decision process has been retained despite the attempt of the scenario exercise to stimulate reframing.

Some attempts to overcome this problem introduce systems thinking into the decision process. For example, system dynamics simulations of different scenarios through micro-worlds can create a game-like engagement with them and help engage the decision maker into a different frame of reference, one that has feedback on the consequences of the decision maker's choices compared to the usual one (Langley & Morecroft, 1996). This approach was clearly recognised as a step forward by de Geus (1997) in his discussion of the nature of play in learning, and the different processes that are needed to switch from assimilative learning to accommodative learning (as defined by Piaget, 1977). The treatment of decision making as a subjective learning process as well as an objective analytical process, points to a whole new approach to decision making under uncertainty.

The anticipatory present moment (APM) offers another interpretation of this state of affairs. In scenario planning, one of the elicitation tools to engage executives with the process is known as the 'seven questions'. These emerged out of work at the Institute of the Future (Amara and Lipinski, 1983) and have several variations. These questions are directly addressed to the decision makers and probe the mental attitude and interpretation of the decision field. At the time this was a striking difference from the established analytical approaches to futures thinking. They proved to be much more effective at triggering an experience of reperception in the executive, especially when shared in a management team. This suggests that the thinking behind the APM might develop further tools for using this kind of elicitation technique which links the external decision field with the subjectivity of the decision maker in an explicit way. The Amara and Lipinski basic questions are:

1. If you could pose three questions to an oracle who can foretell the future, what would you ask?
2. What would you hope for in the best possible world?
3. In the worst possible world, what would be your greatest fears?
4. What pivotal events from the past few years provide good lessons for the future?
5. What major decisions with long term implications are you faced with at the moment?
6. What major constraints do you experience in your organisation and its context?
7. If all constraints were removed and you had the power what would you do?

What is interesting about this approach is that it treats the decision maker as a subject in the decision; it is moving towards second order methodology as distinct from first order decision analysis. It is interesting to view the seven questions in the context of the dimensions of the present moment concept. Question 1 is implicitly appealing to the idea that there might be a faculty that does indeed anticipate the future, which might be as potential (*aionios*), retro-causality (*chronos*) or creative emergence (*hyparxis*). The question answered by a diverse group of, say, thirty executives in a corporation, might reveal anticipatory patterns or indications. Question 2 is about the potential that is latent in the situation and is of future value (*aionios*). This question also relates to "the patterning of hope" (Sharpe 2013, front cover). Question 3 may emerge as fear of the unknown, but it also can emerge as fear of the inevitability of things carrying on as they are (*chronos*). Question 4 relates to the generative past (*hyparxis*) where there are insights to be gained from previous experience that is still resonant in the present. Question 5 is really seating the interviewee firmly in the centre of the *present moment* of which the previous questions have explored some of the content and the boundaries for that individual. Question 6 is paying attention to those factors which are predetermined (Wack 1985) and will inevitably be unavoidable. These constraints are aspects of past influence and momentum (*chronos*), fixed forms such as institutional structures (*aionios*) and situations that keep reproducing themselves (*hyparxis*) in spite of everything (pathological autopoiesis).

13.2 The Notion of Undecidable Questions

In Chapter 10 the idea of second order science was introduced. This needs to be applied to decision making itself: what might second order decision science look like? A pioneer in this area is von Foerster (1995, 2014) in his discussion of what he calls *undecidable questions*. He broke away from the type of science that believes that observer and observed are distinct, separable and non-interactive and, with second order cybernetics, challenged the orthodox logic that considers circularity as an incorrect viewpoint.

In contrast, the reflexive worldview leads to assertions like the following that seem confused from a first-order perspective:

A implies B, B implies C, C implies A

or

A implies B, B implies A

or

A implies A

In other words, the result is caused by itself. In terms of worldview we might say that the separation between the decision process and the decision field is a false dichotomy. The decision process creates the decision field which creates the decision process. The situation is enactive and emergent.

As mentioned earlier, Umpleby (2007) describes the reflexive view of George Soros in his approach to markets and wider social systems. Soros is reported to take the view that in social systems there are two processes – one of observation and another of participation. Science generally only applies observation. Participation places the observer as a player in addition to being an observer. This second order view leads to quite different assumptions and actions. For example, the first order perspective and the second order perspective lead to different models of market behaviour and hence different anticipations of the future, as explained below.

The first order view of, say, a shares market is represented by a dynamic balancing causal loop in which as stock price goes up and becomes more expensive, it has an inhibiting effect on demand which, in turn, holds the price in check. In the second order view, the market is represented by a dynamic reinforcing causal loop in which, as the stock price goes up, the demand increases as buyers "follow the herd". This second order view is reflexive in the sense that it makes sense if the motivation to participate in the market gains is factored in as well as the supply demand balance.

The second order "game" of the decision maker is to read the biases and preconceptions of the various players in the social system. Actors, through enactive cognition, are "bringing forth the world" of the game. However, biases also filter out aspects of the situation and lead to gaps opening up between perception and reality. This can eventually leads to instability and a reperception on the part of players, which sometimes collapse the game system. For example, a credit bubble bursts or a political system collapses.

Umpleby (2007) raises the question as to how a second order framework would change the frame of reference of decision makers:

> *"What would economics look like if beliefs in perfect information, rationality, and equilibrium were replaced with bias, interaction between cognition and participation, gaps between perception and reality, disequilibrium, and boom and bust cycles?"*
>
> (Umpleby, 2007, p 7).

What is the nature of decision making in the context of an uncertain world in which the biases and actions of the deciders are part and parcel of the uncertainty in the system? This raises the

question of ethics as an essential aspect of decision integrity. Von Foerster (1995) makes the point that only decisions about undecidable questions carry the quality of ethical responsibility. Where a question is decidable (selectable) through rational analysis or "mathematical economics", then there is no real decision and the best we can hope for is some kind of application of a moral rule behind which the decision maker takes shelter. Faced with an undecidable question, there is nowhere to shelter. In this latter case, responsibility must reside in the decision maker's action or choice itself. The reason that only *undecidable* questions demand *real* decisions is:

> *"... the decidable questions are already decided by the choice of the framework in which they are asked, and by the choice of rules of how to connect what we call "the question" with what we may take for an "answer". In some cases it may go fast, in others it may take a long, long time, but ultimately we will arrive, after a sequence of compelling logical steps, at an irrefutable answer: a definite Yes, or a definite No."* (von Foerster, 1995, p7).

If we separate the decider from the decision field then decision rules can be applied to the field and, if sufficiently ingenious, the question and automatic selection of an answer is rendered decidable. But selecting is not true choosing. "Only those questions that are in principle undecidable, we can decide" (von Foerster, 1995, p 7).

All this takes us right back to the re-entrant condition, described in Section 4.1, that the decider is part of the decision field. If the decider changes state, then the decision field changes state and therefore both the practical options and their ethical implications come to the foreground. The induction theory of Holland et al (1986) helps us to understand that there is a different operation of the cognitive system needed to deal with undecidable questions. But the cognitive system must also be recognised as a re-entrant system. The implications of this are summarised by von Foerster like this:

> *"... we are under no compulsion, not even under that of logic, when we decide upon in principle undecidable questions. There is no external necessity that forces us to answer such questions one way or another. We are free! The complement to necessity is not chance, it is choice! We can choose who we wish to become when we have decided on in principle undecidable questions."* (von Foerster, 1995, p 7).
> and
>
> *"... with this freedom of choice we are now responsible for whatever we choose. For some this freedom of choice is a gift from heaven. For others it is an unbearable burden: How can one escape it? How can one avoid it? How can one pass it on to somebody else? With much ingenuity and imagination, mechanisms were contrived by which one could bypass this awesome burden. With hierarchies, entire institutions have been built where it is impossible to localize responsibility. Everyone in such a system can say 'I was told to do X'."*
> (von Foerster, 1995, p. 7).

The implications of this insight about choice are critical. Second order systems are participative and have the capacity of choice beyond any inherent rule system. This view simply does not fit the deterministic view of systems.

Locker (1997, 2007) takes a similar viewpoint in formulating Trans-Classical Systems Theory (TCST), which is a form of second order cybernetics. His approach also recognises that a true system can never be fully explained by its properties alone, but has to be considered in conjunction with the systems theory the designer already adheres to prior to designing the system. In this approach, observing and describing the system fuses with knowing and understanding it. Translating this into the arena of decisions we can suppose that the true nature of a decision field cannot be completely known by its description and analysis, but has to be considered in conjunction with the mental model of the decision field that the decision maker holds prior to engaging with the act of choice. Thus any genuine decision system cannot avoid the question of the human being as the ultimate decision designer, and being humanly responsible within the decision field of concern. This is itself a system that is a mutually interactive engagement. As Markus-Ekkard Locker expresses it:

> *"Whenever the observer enters into the system in concern he alters this system and himself. Thus in TCST, both the access system and the system in concern are changing and are open systems that mutually interact with, and depend on one another."*
> (Locker, 2006, p. 9).

The nature of an undecidable question as the only type of question where a real decision can be made appears as a paradox, stated to stimulate our thinking about these issues. The present moment concept offers another, perhaps deeper, interpretation of the structure of the paradox in relation to dimensional framing, and it exposes a layer beneath the paradox.

A decision question which can be answered by applying a rule book or algorithm implies a world which behaves as if it is driven by past patterns or forces which can be codified and can be reproduced. The ambiguity and responsibility of making a choice is taken out by applying the rule. A classic example is the use of hurdle rates for investment. If a market is going to behave roughly the way it has so far, then there is reliability in such methods and the decision maker is effectively relieved of the ambiguity. Also the rule book provides a context of consensus and support often implied in the use of the term 'professional'. The rules are constructed from a combination of past behaviour (*chronos-p*), institutionalised forms (*aionios-p*) and dominant precedents (*hyparxis-p*) and thus are often behind the observation that today's success is tomorrow's failure.

An undecidable question cannot avoid these components but introduces extra degrees of freedom and hence ambiguity. The dimension of retrocausality (*chronos-f*) may disrupt the logical anticipation of analysis. The presence of wide potentials (*aionios-f*), not all of which can be realised and some of which will be mutually exclusive, introduces ambiguity. The capacity of the decision maker or the wider decision community to commit and take on particular future pathways (*hyparxis-f*) is another unknown. This is also a degree of freedom which opens possibilities for creative acts and seemingly illogical ethical stances.

So the reframing this brings is that we can make a distinction between closed and open decision making. The former is closed to the three emergent aspects of the future (designated –f)

whereas open decisions are open to them. Another way of putting this is that we can make a distinction between a driven decision situation and a creative decision situation.

13.3 Decision Integrity

Having clarified how I have used the present moment concept to describe undecidable questions as dimensionally open decision questions, we can now introduce an idea as to how open decisions can be approached and thought about through the notion of *decision integrity* (Hodgson, 2010).

The undecidable question, because of its inherent uncertainty, requires a reflexive ethical commitment that cannot be arrived at by applying business-as-usual rules, whether they be financial or moral. This also means that the decision maker's current mental model, which is a fixed structure of categories and sub-categories, is an inadequate basis for his or her real decision unless he or she experiences a reperception and a pattern shift in mental model. A voluntary cognitive reconfiguration is an essential step to prepare for the decision. This can be described by such terms as inviting reperception, reframing, induction or double loop learning. As we saw in Chapter 9, for this to take place, the conditions of graceful entry have to be established with scope to "play" with an appropriate transitional object.

Open decisions are a key component of strategy work in any form of leadership. Strategy work in management weaves together understanding of the decision field (for example, the global market for energy) with the decision process (for example: how do we make the shift from fossil to renewable energy systems?). An executive group or team running a business will form, from this weaving together, a decision system. This will include formal and informal components and be guided by the explicit and tacit knowledge of the team members. The more long range their strategic concerns, the more the decision field will be filled with complexities and uncertainties; and the more they progress, the more they will be confronted with undecidable questions.

To grapple with the decision field they may create a set of scenarios incorporating speculative narratives about trends and uncertainties, recognising that the nature of their challenge is not a simple 'yes or no'. If they are to employ the scenario set and its supporting analysis effectively, they will recognise that much of their usual economic analysis to arrive at conclusions, though a necessary support, is not a very useful way, on its own, to arrive at strategic choices. Van der Heijden (2005) recognises, over many years of observation and participation in high level strategy work, that decisions are arrived at by a reflexive decision process which is essentially one of mutual learning.

> *"The learning loop model shows the interwovenness of thinking and action. If action is based on planning on the basis of a mental model, then institutional action must be based on a shared mental model. Only through a process of conversation can elements of personal observation and thought be structured and embedded in the accepted and shared*

> *organisational theories-in-use. Similarly new perceptions of opportunities and threats, based on the reflection on experiences of actions playing out in the environment, can only become institutional property through conversation"*
> (van der Heijden, 2005, p. 4).

However, the reflexive mutual accommodation of strategic conversation is still a rarity in management. The dominant mental orientation of managers is deterministic; taking place within a power hierarchy. Management cultures are characterized by non-negotiable hierarchies, and by the domination of powerful individuals who may seek advice but are not open to reflexive review of their biases and beliefs. The result is an absence of learning, a tendency to repeat previous mistakes, large scale external diseconomies and an absence of ethical decision making. In extreme cases this becomes pathological, and has been called the 'hubris syndrome' (Owen, 2009; Daedalus Trust, 2012; Magnam and Cormier, 2013).

Managers challenged by open decisions need to reflect on their role on the following lines, consistent with cultivating a second order viewpoint:

- Recognize that I, the decision maker, am faced with undecidable questions that nevertheless require choice.
- That this places me within, not outside, the system in which I am a manager and hence dominantly in the reflexive rather than an analytic context.
- That I am inescapably faced with ethical dilemmas that cannot be reduced to moral rules. I must therefore make free choices and take responsibility for their consequences.
- That any choice amongst options I make is a function of my own state of mind and understanding, in conjunction with my colleagues'.
- That the nature of being in an organisation with mutual responsibility with others means that the essence of shaping a decision is dialogic and emergent over and above analysis and persuasion.
- That if my exploration of the nature of the decision field and its context does not alter my perceptions and framing, then I have not properly engaged with the decision task (the reperception issue). If the possible future worlds do not change me then I am still in the detached observer paradigm and failing in my responsibility.

Von Foerster (1995) summarises the contrary position this way*: "With the essence of observing, namely the processes of cognition, being removed, the observer is reduced to a copying machine, and the notion of responsibility has been successfully juggled away."* (von Foerster, 1995, p. 7).

The act of reperception is the antithesis of a copying machine. It is an act of induction, of learning. Even simple problem structuring decision methods may become a weakness in the face of undecidable questions. This weakness arises from ingrained subconscious mental patterns that are

difficult to change. We think we are peering into the windscreen of the future but are actually fixated on the rear view mirror. It usually takes the shock consequences of a bend in the road to realise that we have ceased learning. de Geus (1988) takes the view that

> *"… the real decision-making process is a learning process rather than the application of knowledge. Many at high levels of management are convinced they are there because of what they know and how they represent what they are. These statements were saying you're not there because of what you know. You're there because you're reasonably good at intuitively or otherwise finding your way to a learning process together with your colleagues, such that you learn and arrive at new conclusions that are more or less successful."* (de Geus, 1988, p1).

There is an inherent psychological and cultural resistance to the proposition that real ethical decisions inevitably change the decision maker, who cannot be abstracted from the decision system. In today's world of applied management science, in fields such as financial management, the mathematisation of making money inevitably leads to breakdown, both systemically and ethically. There are no "masters of the universe" because, in reality, the fallible human being has not actually been removed from the decision system. The abdication of responsibility to 'copying machines' has its unavoidable consequences. The factors which colour ethics and responsibility are buried in propaganda and kept there by greed and attachment to power over reality. But in actual fact the decision maker is never outside of the decision system.

The proposition for management is, then, that decision support should shift its attention from first order systems to second order systems in which the neurobiology and cognitive psychology of the decision maker is included in the decision system. The overall case is summarised in Figure 13.2. There is a new context for management which has higher complexity, higher uncertainty, dislocation and breakdown of the usual success formulae. There is also increasing moral hazard with destructions on a large scale from money to biological species. The dominant paradigm is one of management drawing on the current science paradigm as seen as an objective and detached measure of things. This is so ingrained that the "old ways" continue to be applied to try and solve the escalating problems.

Decision integrity is an approach that integrates a systems approach in a second order context of the APM and includes the ethics of the decision maker as a legitimate component. This offers the prospect of changing the way difficult or undecidable questions are tackled. Better decisions are likely to be made with a second order approach that includes the examination of assumptions. The previously mentioned method of boundary critique (Midgley, 2000) is an illustration of this. Better decisions can be judged by a number of criteria: reduced unintended consequences, acceptance of responsibility by decision makers rather than abdication, fast learning when circumstances change. This is where using the dimensional framing and the anticipatory present moment (APM) offer some assistance.

Decision integrity as a system, summarised in Figure 8.2 (p108) is expanded in Figure 13.3. Analogous to the idea in viable systems that the system is integral to the environment in which it acts,

the decision field "out there" and the decision process "in here" are one and the same system, which is participative as well as observational. If we are to tackle this it also requires recognition that new organisational forms are emerging that are more congruent with the new second order paradigm and demand the shift to second order management. This is not be easy due to the deeply ingrained defensive routines (Argyris et al, 1985) in current human organisational systems. It require innovative research into fields such as embodied cognition, distributed cognition and 'next organisations' (Reichel, 2008).

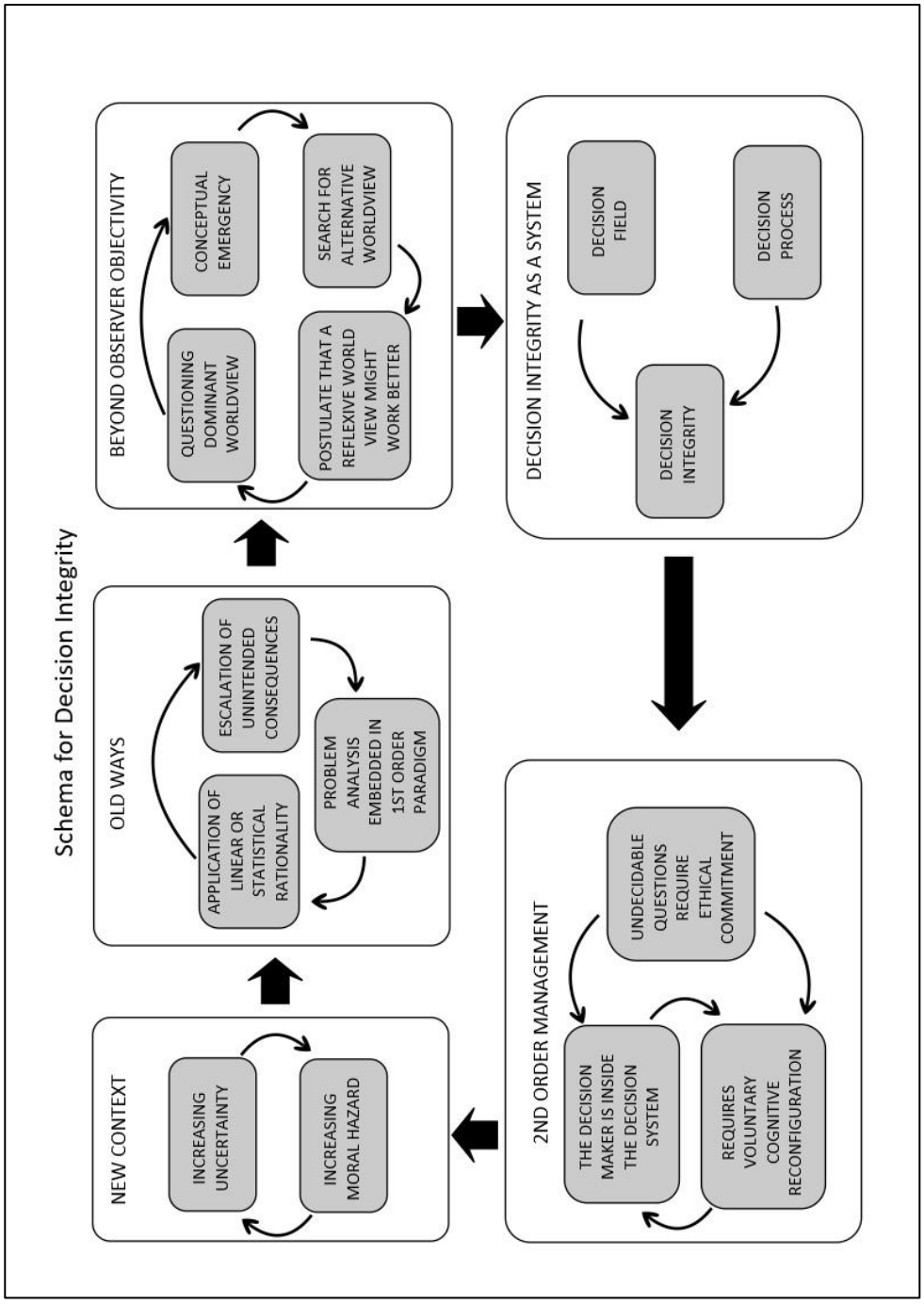


Figure 13.2 Schema of Decision Integrity

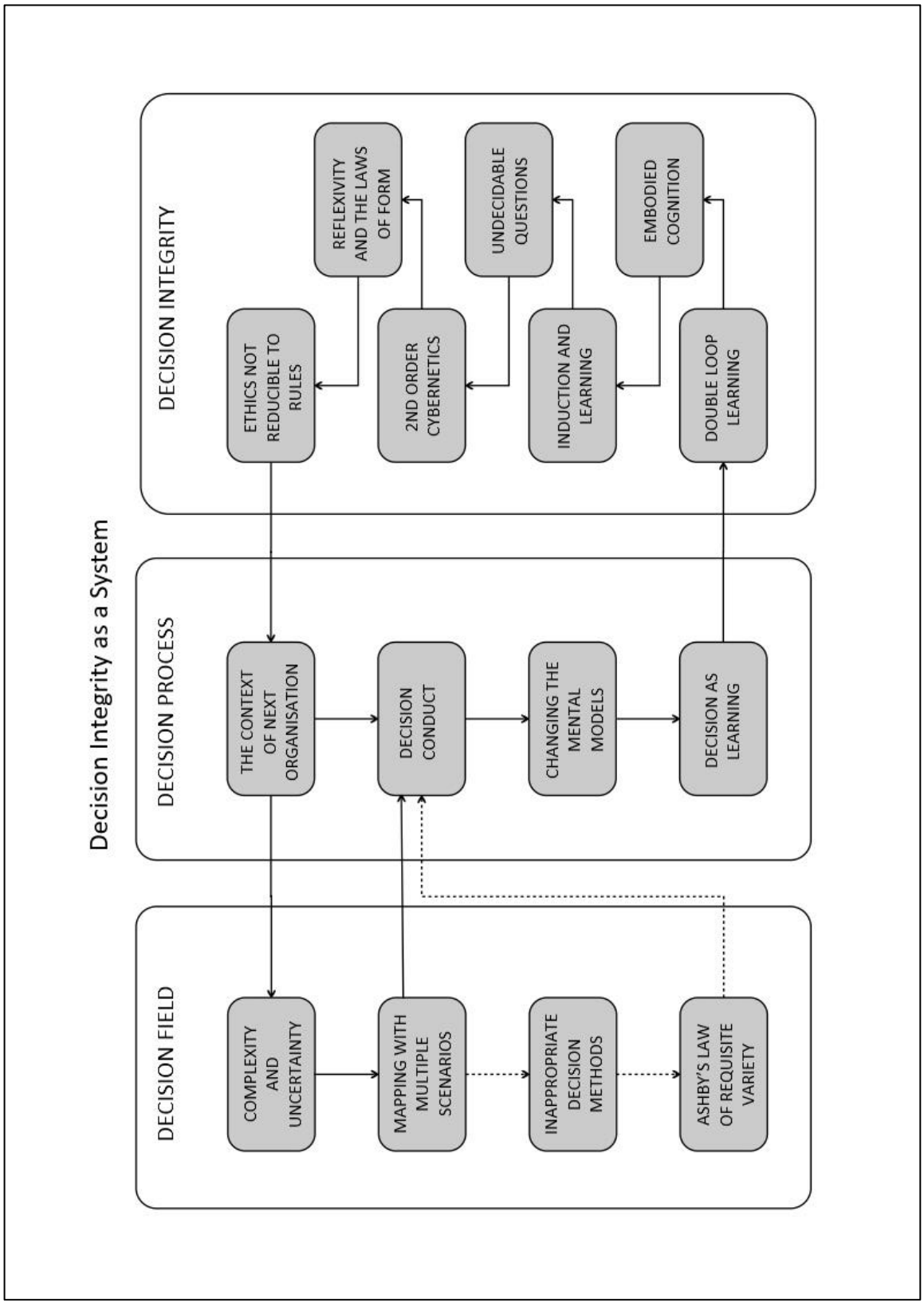


Figure 13.3 Decision Integrity as a System

`One conclusion from this exploration is that we have a legacy of applied management science that is incongruent with the increasingly unruly nature of the real world. Further, by sticking to these mis-matching decision processes, we are actually exacerbating the situation. In the new global era, continuing the objectification of the world assumes that we are not part of the world system, obscuring the reflexivity of our actions in the quest for control, certainty and predictability. Just as Newtonian science finds itself subsumed in a larger paradigm of relativity and quantum physics (Bohr, 1976), so observer detached management science needs to be subsumed in a larger and more reflexive notion of that science. Discussion of this is beyond the scope of this chapter but it is important to recognise that management science is not actually detached from the current transition to the global age. Albrow (1997) puts this in context by making the case that the era of modernity, which is deeply enmeshed in the objectivist science paradigm, has come to the end of the road. The new situation is *globality* which confronts us with bigger and potentially more fatal issues of responsibility concerning the limits and consequences of our decisions.

Decision integrity, as a management capability, can only be developed by its practice. One approach to this as the 'mindful anticipatory present moment' is described later in Chapter 16. Some differences between first order and second order decision making are summarised in Table 1, which uses the basic distinction made in Chapter 1 between the world of complications and world of complexity.

Decisions in a world of complication	**Decisions in a world of complexity**
• Susceptible to decision analysis • Can be modelled with first order cybernetics or systems theory • Abdicates responsibility to "the system" or decision rules • Values are "mechanised" as impersonal moral (or immoral) rules and conditions • Consequences are subsumed into the predictive tools and techniques • Skills of decision *analysis* are predetermined or configured to give a calculable outcome • Error and failure are attributed to changes in context and external circumstances	• Decision analysis insufficient • Requires a shift to second order cybernetics, soft and critical thinking • Requires the decision maker to assume ethical responsibility • Values are embodied in the personal ethics and consciousness of the decision maker • Consequences are continuously monitored in the act of observing the observer - reflexive • Skills of creative decision *thinking* and dialogue exercised by the decision maker • Error and failure are treated as feedback to the decision maker as learner

Table 13.1 – Comparison of decision making in complicated versus complex situations

In summary, any methods of decision support based solely on analysis of causal history will be deficient in anticipation. I have called these 'closed decisions'. For open decisions, decision support needs also to include a reflexive component based on active awareness of different dimensions of future latency and creative openness. The capacity to anticipate will then be significantly increased.

Reflection on Chapter 13

This chapter draws strongly on previously published work on management cybernetics in which I analysed and described my idea of decision integrity from the perspective of second-order cybernetics (Hodgson, 2010). This work was encourages by Steven Wallis (Wallis, 2010) also stimulated by exchanges with Reichel (2008), through which I was introduced to the work of Luhmann and prompted to revisit my much earlier encounter with Spencer-Brown and Stafford Beer that took place in the 1960s when I was a full time Senior Research Fellow with J.G. Bennett. Henri Bortoft was a research colleague at the time, and his interest in new modes of doing science coupled with our conversations with David Bohm fired up ideas that have been active in my thinking ever since.

The implication for me of repositioning and elaborating this work in this chapter is the interesting observation that, at that time, the notion of second-order science was not on the agenda and thus not even articulated to the degree that it has been today by Muller and Riegler (2014) and colleagues. Several ideas have been clarified, strengthened or added in the further thinking reported here:

Firstly, there is the idea that the two-fold meaning of integrity takes a firmer place in the context of second-order science, as two sides of the same coin. On the one side integrity implies a coherent system or pattern, the significance of which is in its wholeness. Fragmentation is not integrity. Secondly, the presence of the observer/decider is fundamental to the present moment, and hence scope and scale, and above all, the *ethical* integrity of any decision. This is not simply a 'subjective add-on' to an objective stance. Thirdly, there is the implication that decision thinking is not simply adding thinking to making decisions but requires the decision maker to 'show up' and take responsibility for the choice that is being made in as wide a context of space and time as is possible. Fourthly, in light of this last point, if we are to tackle complexity, forms of collaborative decision making are needed to embrace the requisite variety of the world we humans are now engaged in. Fifthly, that such collaboration, to be integral and intelligent, needs ways of arriving participatively at shared present moments congruent with the findings of an extended boundary critique. In the absence of an understanding of the APM or something analogous the foundations for integrity are non-existent.

Chapter 14: The APM as Meta-Framing

The point of the theory of the Anticipatory Present Moment (APM) is to add a new second-order perspective to our view of systems and futures, referred to here as meta-framing. The implications of the APM need to be tested in reflections that augment our understanding of already established systems and futures methods. This is one way that the usefulness of theory to practice can be evaluated (Midgley, 2000), and it will be done through an analysis of five topics through an APM perspective:

a) boundary critique (Midgley, 2000)
b) the viable systems model (Beer, 1985)
c) world modelling (Hodgson, 2012)
d) the dilemma method (Hampden-Turner, 1990) and
e) the three horizons (Sharpe, 2013)

These topics have been selected for their relevance to my ongoing research and based on my experience. The first three sit mainly in the systems field and the following two in the futures field. The final topic of three horizons will be treated separately in Chapter 15.

The method of second-order interpretation arises from the two concepts in Section 12.3: dimensional framing and the anticipatory dynamic model. The former places the selected method in the context of the six dimensional framework, and it identifies corresponding aspects that give an interpretation of why the method works. The latter reveals the contribution that the method can make to anticipation if the characteristics of the APM are consciously attended to.

Chapter 16 will then focus on the reflexive aspects of the role of the observer/decider/ participant, whose state of mind is an aspect of the system and a crucial factor in an anticipatory effectiveness. This will bring the previous review of second order cybernetics, second-order science and reflexivity into the realm of practice. The key to this practice is a specific form of mindfulness used as a way to increase the chances of reperception as described in Chapter 9. The application of the APM is itself a step of induction, a provocation to creative insight, and an act of enactive cognition.

An analogy to this framing from physics is the examination of objects in different wavelengths of the electromagnetic spectrum when different aspects show up according to the wavelength. Visible light, UV, infrared and X-ray; each reveal different aspects of an object when illuminating it. Examining systems and futures methods through the lens of the APM aims to reveal other characteristics of such methods not visible in the way they are usually regarded.

14.1 Boundary Critique and the APM

A primary goal of systemic intervention is the improvement of the system in question. The definition of ‘the system in question’ is often itself a function of multiple stakeholders and is not a

fixed object. Boundary critique (Midgley 2000) can be helpful in clarifying the ambiguity and the power dynamics around agreeing what the system is that is to be improved and for whose benefit. Let us describe some essential features of systemic intervention.

For a given application we can distinguish the following components:

Systemic – attending to wholes, connectedness and non-linear behaviour, with a special emphasis on boundaries concerning who and what is included, excluded or marginalized

Intervention – "purposeful action by an agent to create change" (Midgley, 2000, p113).

And linking these two:

Systemic Intervention – purposeful action, incorporating reflection on boundaries, aiming to bring about some *improvement.*

Clearly, what constitutes improvement is a judgement call (Churchman, 1970), and like any judgement call depends on the stakeholders making it. Midgley and Pinzón (2011) point out that one of the most critical judgements prior to settling the specific meaning of improvement in a given case, for example of conflict resolution, is the determination of the boundary of the system. The development of boundary critique here follows form diagram 2.1 and its accompanying description.

Figures 2.1.and 11.5 are now extended to incorporate the idea of time or present moment boundary in Figure 14.1

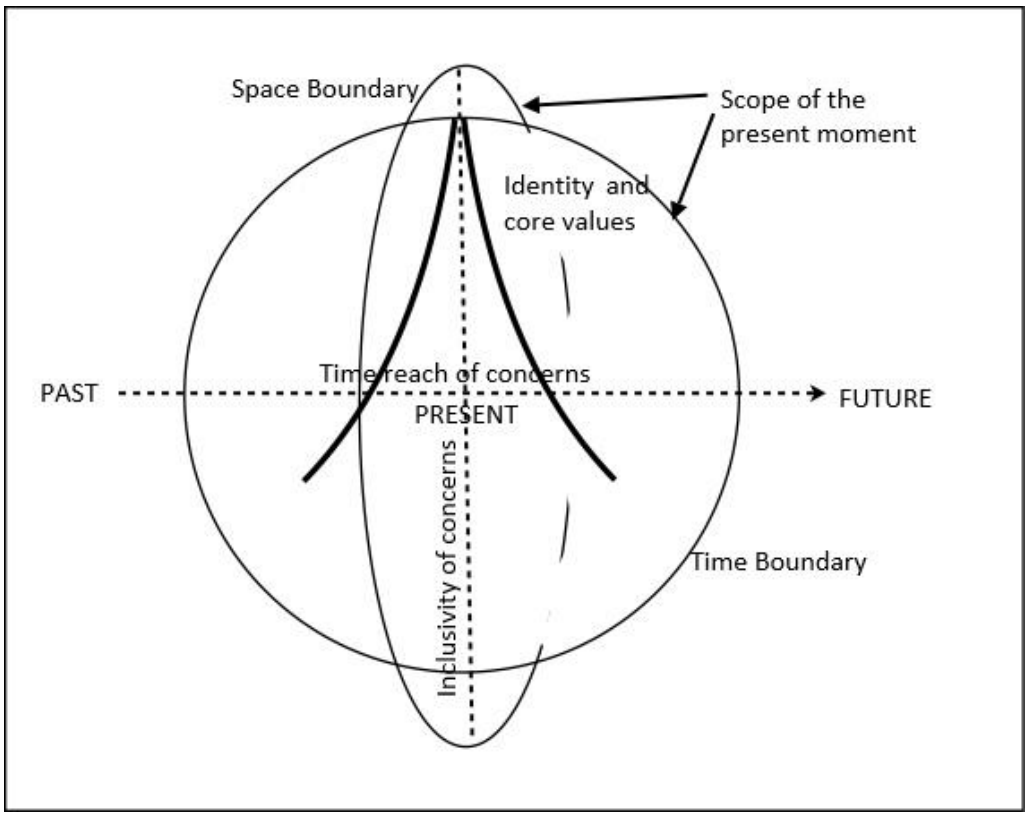


Figure 14.1 Boundary critique in the present moment (note the different terms are explained in the following description).

The diagram in Figure 14.1 is limited to that of a single stakeholder or where there is agreement between multiple stakeholders in the system. The system boundary is represented by the circle orthogonal to the plane of the paper (turned 90^0 from the original diagram). The peak represents the 'centre of gravity' of the sense of identity and underlying values that make the system in question meaningful. An important element of boundary critique is not taking boundary judgements for granted, but comparing and contrasting different possibilities for setting boundaries, in order to explore the likely consequences for stakeholders and the issues that concern them (Ulrich, 1983).

The boundaries represented in the above exposition are essentially about content, and tend to be spatial and semantic in character; who and what is included or excluded. Mapping boundaries helps to surface assumptions and clarify agreement about what is in and what is out of the system in question. Extending this to the time aspect, the circle in the plane of the paper represents the present moment or time span of the set of concerns relating to the system. In foresight practice, we talk about 'temporal windows'. However, to relate time to the systems idea it is necessary to go beyond the simple linear, sequential view of time to the richer concept of the present moment. This is especially true where the situation of interest is going through some kind of transformative change.

In the case of stakeholders in contention on the boundaries of the system, it would be necessary to use several of these diagrams with degrees of overlap. This requires a more sophisticated analysis (Midgley and Pinzón, 2011). To illustrate this, a case with two contending values and identities is represented in Figure 14.2 using the extended boundary critique of Figure 14.1.*Figure*

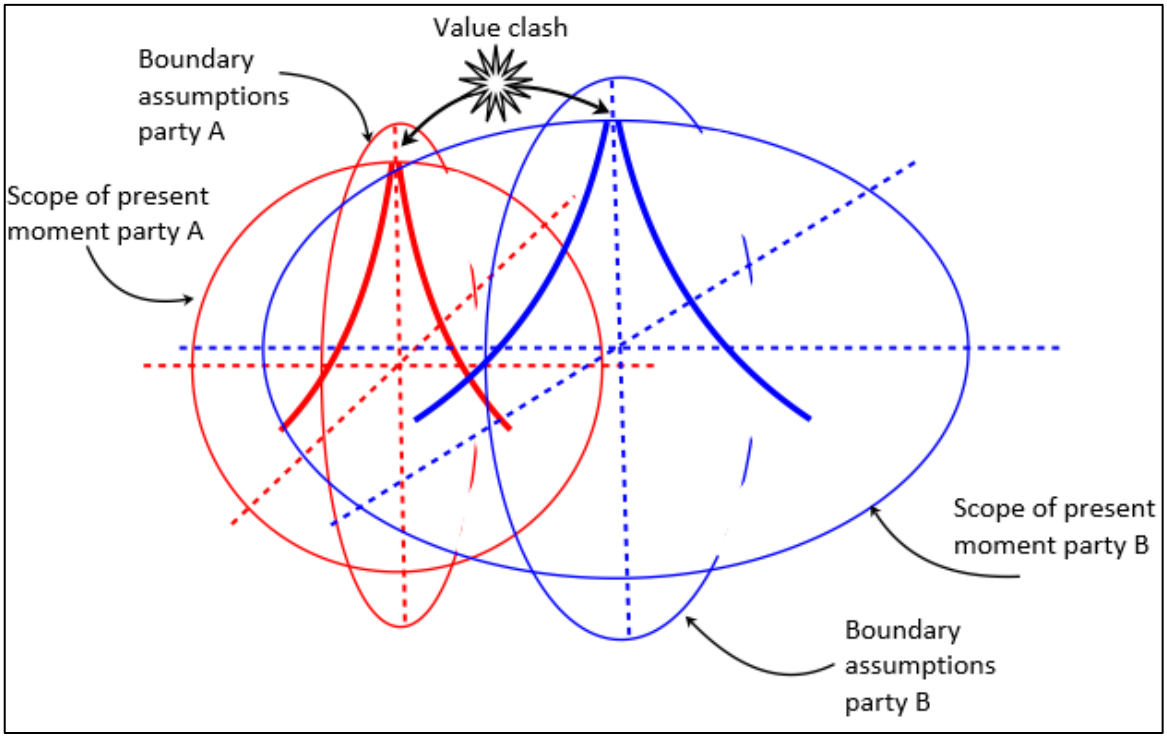


Figure 14.2 Two parties to a systemic intervention with different values and differing present moments.

Two parties or stakeholders are represented; one red, one blue. The relative size of the red (party A) and blue (party B) components illustrates that, despite significant overlap, they are seeing the system in question in distinct ways. The difference between the red and the blue peaks represents a different set of values and distinctive identity difference. This creates a value clash which leads to problems of relevance, priority and intent. Resolving these differences is likely to be difficult even though there is significant overlap, especially for the red party. Underpinning reasons for this is the difference that their values make to the scope they see of the systems (content boundary assumptions) and the present moment that is embraced by their concerns. In the former case party B has a wider content boundary and may feel that party A will ignore or not even see these factors. In the latter case party B is clearly concerned about much longer term and complex implications than party A.

The potential of bringing APM into the process of boundary critique is that it gives an added intentional prominence to the time perceptions of the different parties. By this I mean not just the conventional short, medium, long-term but the reflective aspect as to how the time boundaries of concern are being experienced. For example, even if a problem is rationally recognised as longer term, the psychological pressures of an immediate crisis can shrink the considerations that are taken into account. Being facilitated in a second-order manner to arrive at a closer shared anticipatory present moment could release greater common understanding beyond simply intellectual analysis.

14.2 The Viable Systems Model and the APM

A basic outline of the viable systems model (VSM) is given below before applying the APM to its interpretation. This outline is my own distillation from extensive practice in introducing the idea to managers. The ideas are reformulated from various sources including Beer, (1985, 1989) and Espinosa and Walker (2011). The VSM gives an account of an organisation inspired by the physiology of the human organism. The primary structure is shown in Figure 14.3.

The more viable an organisation is, the closer it can be seen to be operating according to the principles of the viable systems model. Picture the description that follows as being more about the physiology of an organisation rather than its anatomy. Viability is essentially a structured process which relates three elements: the environment, the operation and management. The specific forms it can take are many and varied and adapted to diverse habitats and diverse roles within habitats; it co-evolves with the environment. For example, we can determine the key characteristics of mammals e.g. reproduction, rearing young, internal temperature regulation and so on. However, there are many distinct forms of this system - bears, cats, mice. The viable system has five subsystems, such that if one of them is dysfunctional or is poorly connected to the rest, “illness” or “death” will surely follow. There are several ways of describing the subsystems depending on the system in focus although Beer preferred not to bias interpretation of the subsystems with inadequate naming. A very brief description of the five subsystems from an organisational perspective follows.

System 1 – Operation and Action

System 1 is the primary activities of the overall systems, where the purpose is delivered in practice, the values are expressed and the vision realised. It is the set of operational units that has the capability of acting on behalf of the organisation and conducts its day to day businesses. In any large organisation there are many Systems 1 and these should operate under the strategic guidance of System 3. However, any System 1 must itself be a viable system and therefore have its own identity, knowledge creation and appropriate degree of autonomy. This is the principle that viable systems are recursive. Systems 1 should be continuously generating their own grounded and unique performance advantage.

System 2 – Balance and Stability

Different Systems 1 will inevitable develop conflicts of interest, for example around use of resources. Also action in an environment always encounters the unexpected and the unplanned. This may appear as problems or opportunities that call for on-the-spot decision and action. Conflicts of interest will inevitably arise. System 2 provides conflict resolution and "dampens" the oscillations these conflicts, acting as a kind of "thermostat". Off-line, the experiences and perspectives of System 1s are facilitated through feedback and dialogue into new understandings which then help System 3 see more clearly what is going on and what needs deciding to keep things on track. This is a very weak spot in most organisations because of the "knowledge is power" pathology. System 2's job is to provide processes which can deal with conflict of interest, with techniques ranging from timetables to direct facilitation.

System 3 – Direction and Regulation

The role of System 3 is to sustain, optimise and enable implementation of a set of actions that makes strategic progress in fulfilling the purpose in a given time period (the next quarter, the next year and so on). The focus of this system is more on the now, current decisions, and inside the organisation. System 3 manages the portfolio of action programmes and their resource negotiation to achieve synergy such that Systems 1 worked better than if they are acting in isolation. System 3 sustains a resource bargain that agrees and decides the allocation of resources amongst the various Systems 1.

System 4 – Alignment and Strategy

Any organisation lives in a wider environment of space and time, a habitat. Its viability depends on its ability to adapt and survive in a changing environment. System 4 is the function of looking outside and into the future. Looking outside implies scanning the environment, interpreting the signals despite uncertainties using futures thinking. It is also engaged in researching and devising options for submission to systems 5 and 3 and sustaining the integrity of the internal models of the organisation as an organism. It is the anticipatory system that helps alert to the need to adapt to change in conditions. System 4 also is the custodian of how things work around here, for example

what the business model is. System 4, in reciprocal interaction with Systems 3, is the heart and core of the generation of strategy.

System 5 – Identity and Purpose

A living organisation has a unique identity related to its primary purpose, its values, its sense of self or identity and its membership. System 5 is required to provide oversight and sustain the ethos that coheres the organisation. From one perspective is the community of members that perpetuate the organisation, the true 'we' of the organisation. It is usually a network across several stakeholders. This role is often embodied in some kind supervisory board. System 5 is responsible for monitoring the effectiveness of the interactions between Systems 3 and Systems 4.

Systems 5, 4, 3 and 2 taken together constitute the meta-systems, whereas Systems 1 constitute the operations. Together, the meta-system and the operations are in interaction with the environment See Figure 14.3. This brief overview of the VSM provides the background for the APM metaframing that follows.

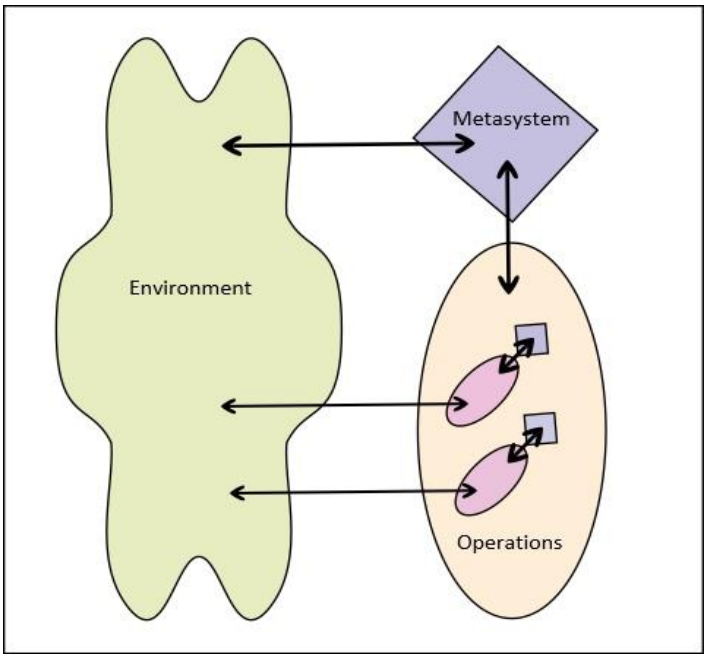


Figure 14.3 Simplified Schematic of the VSM

The proposition made in this section is that a viable system can sustain an anticipatory present moment (APM) as a second-order state compatible with its need to maintain its viability in a given environment. It has the capacity to learn from feedback and adapt, providing better ways of thriving in that environment.

It also has the capacity to learn from feedforward (signals which go beyond information from the past) and anticipate new, more radical shifts in its environment. In addition, it can synthesise these two forms of learning which, at times, will appear diametrically opposed. For example, feedback may indicate prioritising an action A for immediate benefit, whilst feedforward may indicate that a very different action B (and implied re-allocation of resources from A to B) is needed for longer term sustainability.

In a social system, this can pose a considerable challenge to the people who are involved in that system. Espejo (1996, 2000) has formulated this challenge as the "*requirements for effective participation in self-constructed organisations*." p956. Self-construction is a process that implies a

reflexive system in which there is conscious participation in the creation and production of social meanings that support the emergence of viability (Espejo, 2000).

> *"We need structures that allow us to bootstrap our desired meanings, values and norms in the system's operations. The dilemma is that often this bootstrapping means finding the way to produce a different system altogether. We need to change the system's identity. This kind of double loop learning (Argyris and Schon, 1978) is particularly difficult when the social system does not have the capacity for self reflection. This is a major obstacle for double loop organisational learning (Kim, 1993; Espejo et al, 1996)."* (Espejo, 2000, p956).

According to Espejo, reflexive self-constructing social systems, to be successful, have a number of underpinning conditions. People who are involved need to have a strong commitment to the viability of the system in question. The system needs to be autonomous within a context of autonomous systems. This is not the same as conventional hierarchy and corresponds pretty well with Koestler's (1967) definition of a holon, combining and balancing autonomy with integration. The primary activities of people need to align at these different levels of recursion.[37] This is not simply an operational requirement but requires communication beyond information, the development of system cohesion and a healthy mutual appreciation between people. Espejo emphasises the need, for example, for a quality of citizenship which arises out of shared purposes, learning and a sense of cohesion from the closing of communication loops.

Viability has been deeply studied in relation to social systems (e.g., Espinosa and Walker, 2011), using especially the VSM of Beer (1985). In Figure 14.3 a simplified representation of some key aspects of the viable system are highlighted in order to make clearer the relating of the APM to the VSM that follows.

It seems to me that there are similar insights in Rosen's anticipatory systems theory and Beer's interpretation of homeostasis.

> *"A device that seeks equilibrium in the face of external perturbation, that is perturbation already familiar from experience, is capable of stability. But a device that can adapt to unexpected perturbation, insofar as the new perturbation is outside the range of familiar experience, is capable of ultrastability."*
>
> *Beer, 1994, p236*

This seems analogous with the distinction in the APM between feedback that is adaptive with known schema and feedforward that requires the creation of new schema to meet novel situations. In the VSM the integration of these two aspects is in the S4-S3 homeostat where I postulate that the stronger this aspect of the VSM is an anticipatory system the more viable the system will be in the face of uncertainty. An effective anticipatory system will be ultrastable. In that sense Beer's

[37] In VSM recursion is the principle that the Systems 1 themselves must be viable systems, reflecting the same VSM structure. A living organism is compose of living cells.

development of Team Syntegrity can be interpreted as a way of equipping the VSM with a more powerful anticipatory system.

The diagram in Figure 14.4 is not a direct technical reproduction of the VSM, but is a sketch of some aspects to show where I believe the APM throws new light on the effective working of the VSM. The diagram highlights the five sub-systems simply indicated by the numbered ovals 1-5. The green area represents the environment in which the organism is embedded. System 1 is whatever set of operations the system needs to deliver its action to satisfy needs or desires in its environmental niche. System 2 enables the organisation to continuously balance and co-ordinate functions and harmonise internal conflicts. System 3 holds the implementation of the organisational strategy together. System 4 is concerned with the external environment and foresight. The anticipatory system requires the integrity of System 3 and System 4 working together to ensure the future is taken into account in present decisions. and is the seat of the organisations anticipatory system. System 5 holds the identity, purpose and values of the overall organisation and should sustain the S4 to S3 anticipatory capability..

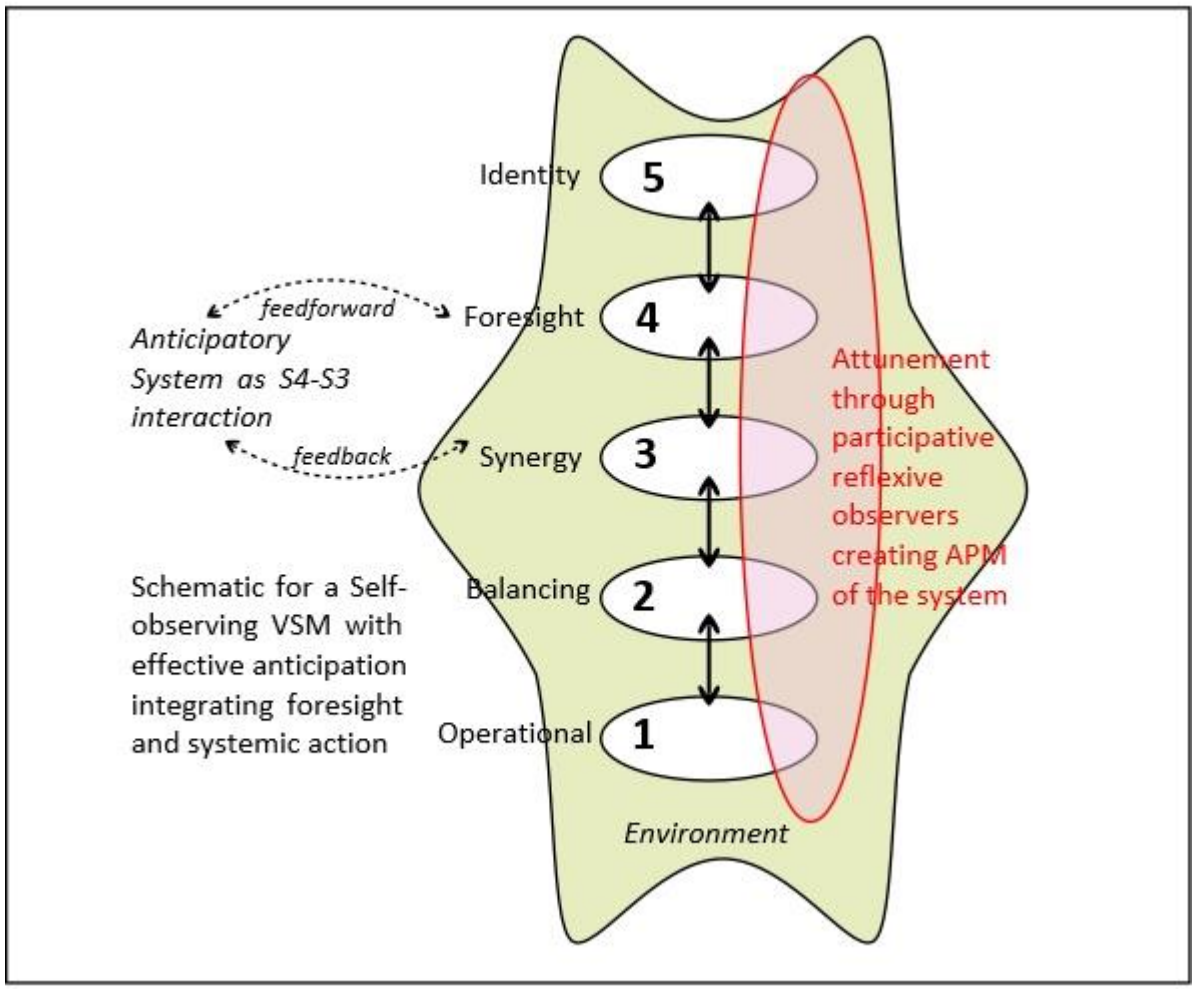


Figure 14.4 Schematic of VSM as Reflexive

The red ellipse labelled emphasises that in the APM interpretation the VSM needs to be a self-observing system capable of sustaining a present moment commensurate with the raison d'être of the system. This point regarding the role of the observer has been made by Espinosa and Walker (2011): *"Managing complexity then is a highly subjective issue: it varies from observer to observer, and is directly connected to cognition: an observation of the world is always filtered by the observer's own mental models."* (Espinosa and Walker, 2011, p29).

The reflexive attunement through participative observers implies that the observers are able to examine their own mental models and effectively practice double loop learning. The attunement factor has strong analogies with Espejo's (2000) idea of coherence mentioned earlier.

How, then, does this relate to the capacity of an organisation to anticipate? Figure 14.5 indicates how the APM (taken from Figure 12.4) functions in the meta-system of the VSM.

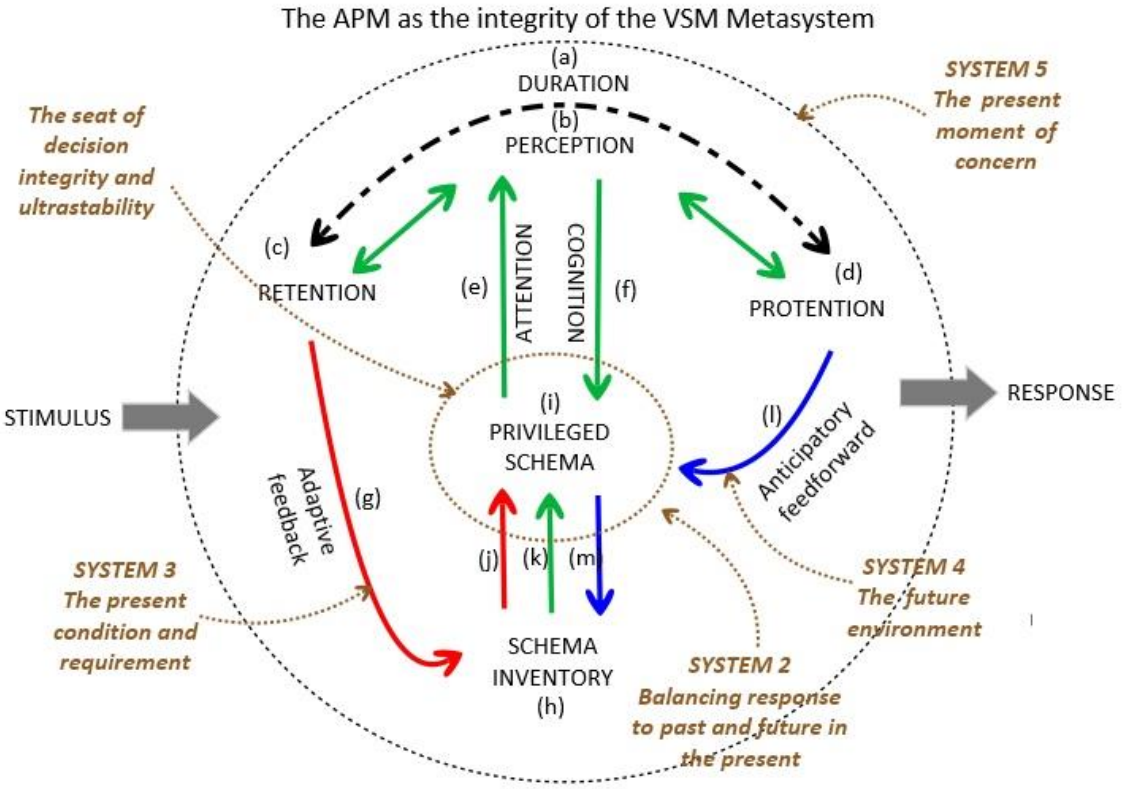


Figure 14.5 The VSM in the anticipatory present moment.

In figure 14.5 the circle represents the system's present moment reflective of the boundary between the system and its environment. This can also be regarded as the arena of relative autonomy within which the system has agency. The duration, represented by the curved dashed double headed arrow at the top of the diagram, is the temporal aspect of the multi-dimensional systemic present moment held together by System 5 and which relates to the arena of concern of the enterprise. Systems 3, focussed as it is on the here and now generally acts on the most immediate information it receives as feedback from the organisation. System 4, scanning the environmental horizon, is developing its foresight as to future environmental conditions, especially those which are discontinuities from past experience. The S4-S3 interaction needs to find accommodation between information from the past and present and information from the future. This is the challenge to the integrity and the ultrastability of the organisation. System 2 needs to be balancing the demands of acting on information from the past (feedback) with information from the future (feedforward) in the present moment. A viable system acting as one system in the face of unfamiliar change will be able to anticipate conditions in a way that an organisation lacking this integrity will be unable to do.

14.3 A World System Model

Developed from early work of the Club of Rome (King and Schneider, 1991), the world system model (WSM) has been conceived as a cognitive framework or mental model which encourages a transdisciplinary approach to planetary problems on any scale, and provides an interpretive interface between human intelligence and data scanning (Hodgson, 2012). This particular model (See Figure 14.5) is not a calculus but a mental representation which helps people to visualise and share insights into fresh emergence from the unfolding situation. The basic version of the world system model is shown below.

This is a model of the basic social-ecological system that is currently highly fragmented in our dominant analytic, compartmentalised culture. Although there is increasing recognition of the need for whole systems approaches to the global problematique (King and Schneider,1991) this has not been successfully translated into integrated and balanced action (Goerner et al, 2008; Ehrlich and Ehrlich, 2013). In summary, initiatives and policies too often lead to unintended consequences, and are fundamentally vulnerable to being blind-sided or subject to synchronous failure (Homer-Dixon, 2006).

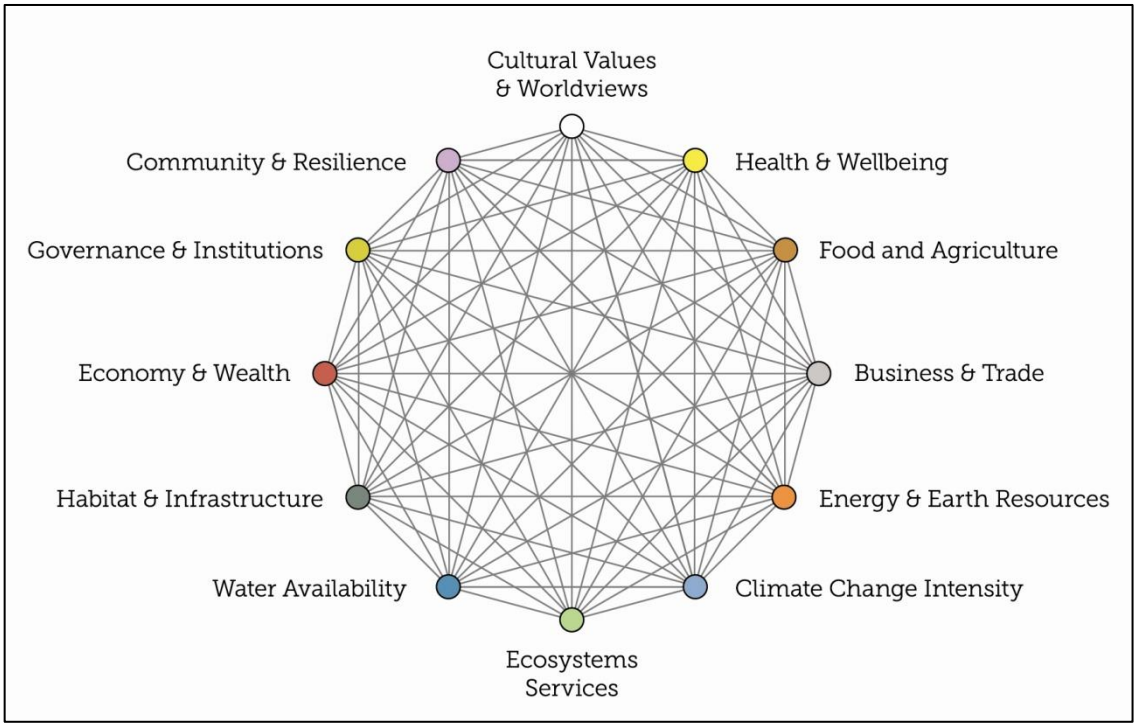


Figure 14.6 Model of a Balanced Social-Ecological Planetary System

One of the observations that motivated my development of this world system model was that even quite obvious relationships between things in the world system are treated in separate compartments in policy systems and are not considered together. For example, the recent seventeen UN sustainable development goals are presented in a compartmentalised way with no indication of their complex systemic interrelationships[38]. It is clear, for example, that energy and food are highly interdependent; as are energy and water. It is also clear that society is having great difficulty in connecting social behaviour, such as consumerism, with peak resource issues and the untenability of continuous economic growth on a limited planet (Stern, 2007; Grubb et al, 2014). The requisite variety of the world system model derives from the multiple possible combinations of the twelve nodes and the significance of the sixty six interconnections (Hodgson, 2012). Even so this representation is still basically first order.

Converting the WSM into a game makes it reflexive and participative, and places it in a second order context. The model becomes something to inhabit rather than simply learn as passive knowledge. It takes on a generative value for the participants. Interaction between people and the model is reflexive, influenced by the acceptance, modification or rejection of the mental model and its data. Actors using the model create their own world interpretation (Hodgson, 2011).

[38] See http://www.un.org/sustainabledevelopment/sustainable-development-goals/ accessed 16/4/2016

The world system model diagram is, to the active eye of the beholder, a gestalt. It is a holistic pattern that holds together a wide diversity of factors and helps the mind pay attention to a bigger picture. The diagram also has a property that links gestalt and recursion, analogous but distinct from that present in the Viable System Model (Beer 1985). It can be applied at different scales. This means that there can be an invariant frame of reference and meaning recurring at different scales that can help linking different levels in tackling complex challenges. Conversations between levels (e.g. village, town, bioregion, city) are enabled by the common frame of sustainability and resilience which they each share.

The idea of the game based on the world system model is to rehearse interlocking responsibilities. The game helps to dissolve silo thinking and encourage cross discipline collaboration. In the game role play twelve, twenty four or thirty six people are distributed around the nodes in the circle represented in Figure 14.6. One person takes the role of a 'Chief' or 'Minister' responsible for a given node. The challenge of the game is collaborative rather than competitive. Put another way, the aim of the game is to 'beat' the problematique as it is focused on the group's special interest. This might be city, a village or a function like health care or water security. The shared task of the participants is to generate a creative contribution to resolving their chosen aspect of the problematique. The principle is summarised as holism with focus. This requires the game to become a simulation of an anticipatory system.

It is usually played through the following stages:

1 Introduction, briefing and role allocation

2 Round 1 - Finding Our Concerns in the Big Picture

3 Round 2 - Anticipating Present and Future Challenges

4 Round 3 - Wisdom Circle - Creating Wise Actions

5 Debriefing and Learning Review

The WSM as a diagram represents an ideal pattern, the potential in *aionios*, of relationships in a viable socio-ecological system, whether that is on the scale of the village, a city, the country, or the whole planet. This is then translated into a game board[39] and a process.

Each round has a different emphasis in the context of the APM, as illustrated in figure 14.7.

[39] For a full account of the game see *Ready for Anything*, Anthony Hodgson, 2011, Triarchy Press.

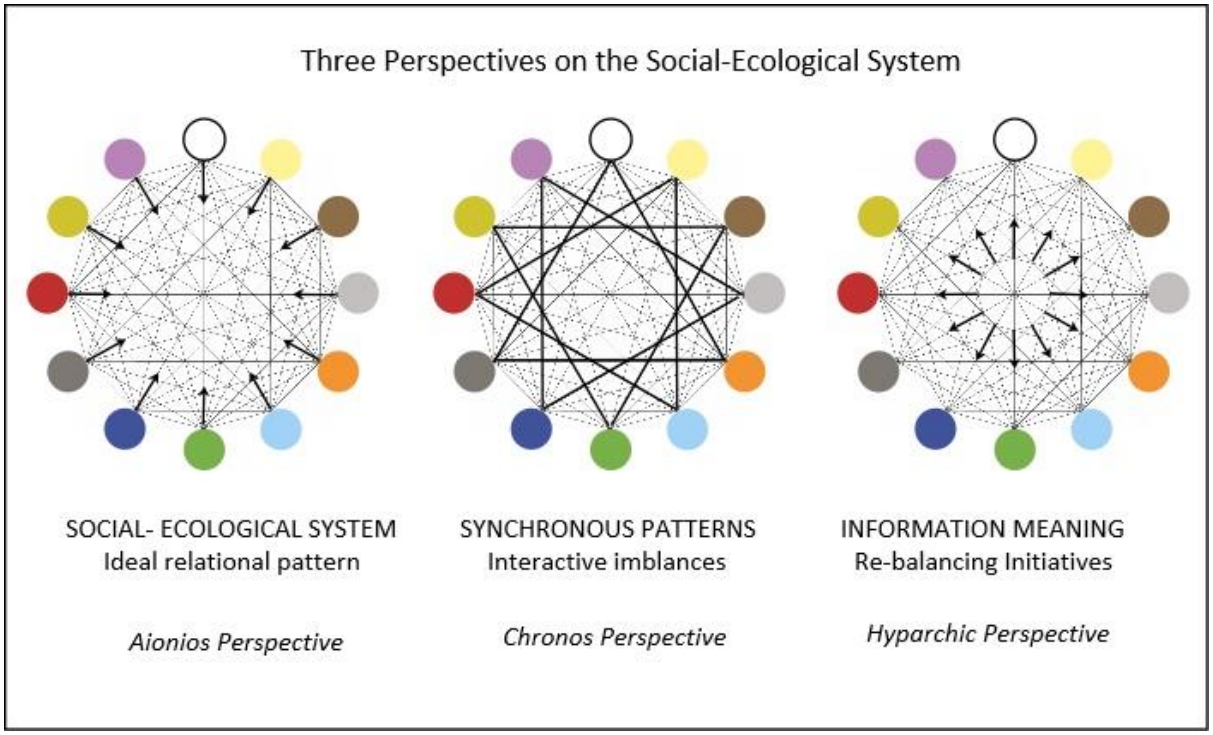


Figure 14.7 The three phases (rounds) of the IFF World Game in the APM

In Figure 14.7 the three main phases or rounds of the game are represented by the three versions of the world system model. At the start in round one the pattern is to gather the concerns of the chiefs and see an emerging pattern in the whole, this ideal pattern is populated with the actual conditions. In the second round four scenarios are worked in parallel represented by the four triangles generating possible combinations of interactions that could lead to synchronous failure generate anticipatory scenarios. In this stage time, *chronos*, is unfolded. In round three the participants propose decisive initiatives to enhance viability and resilience thus emphasising the *hyparchic* dimension which is the willingness to act in the midst of what has been seen and learned.

An interesting feature of the WSM and its associated world game is the use of this kind of gaming to generate group anticipatory system systems. The APM interprets the structure and dynamics of the game in a way that reveals its anticipatory nature, as shown in Figure 14.8.

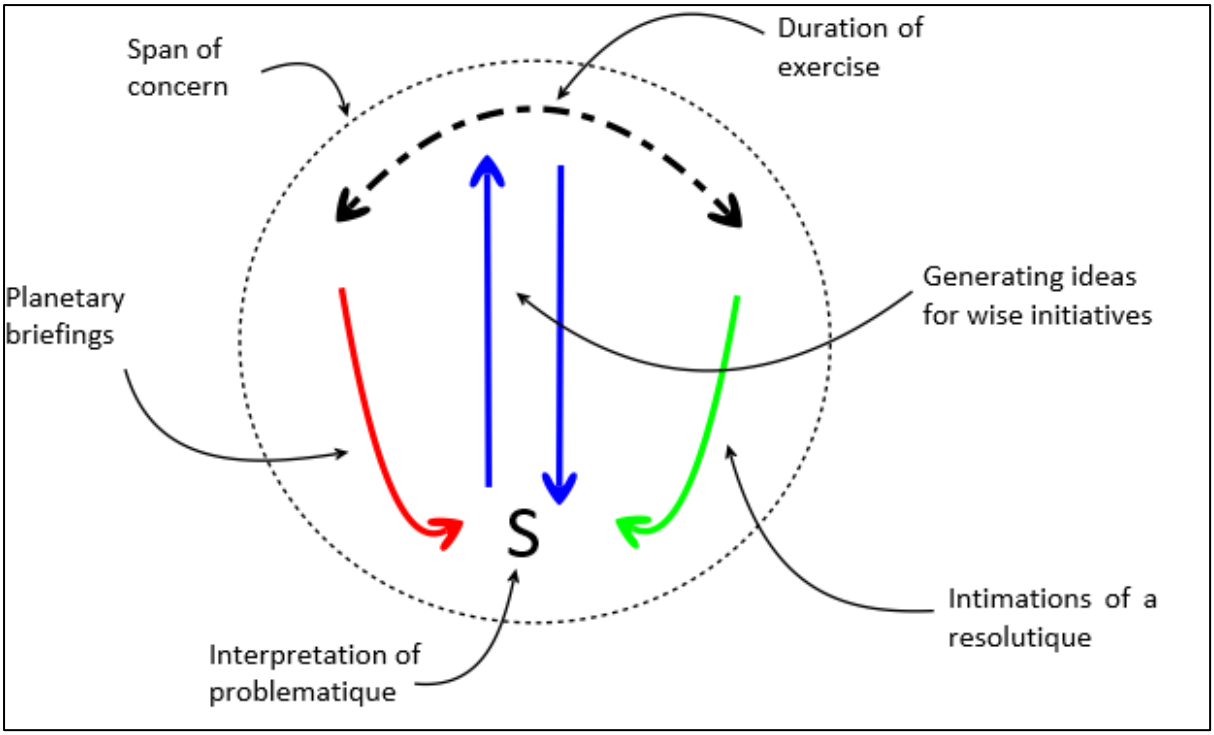


Figure 14.8 The IFF World Game as an Anticipatory System

The circle represents the span of concern in the game which can be shorter, as in becoming ready for impending crisis; or longer, as in generating a 30-50 year strategy for a resilient city. The present moment of the game is also determined by the scale which is considered. (e.g. village, city, bioregion or the whole planet). The feedback influence is constructed in Round 1 of the game with researched briefings on each node. Judgements are made as to their possible relevance to the focus of the exercise. In Round 2 the implications of these are interpreted with attention to speculative futures to see what insights are generated. This is creating wider information from the possible futures. The Round 3 deliberations in the manner of a wisdom council evoke wise initiatives that integrate past and future in recommendations or decisions. These are more likely to have an anticipatory quality/

World Game (2014, 2015) examples are accessible in the References.

14.4 Dilemmas and the APM

A very important feature of complex situations in human affairs is that they confront us with multiple dilemmas. Dilemmas are situations of polarisation and tension where reducing them to either/or choices is in error because simple binary distinctions simply do not correspond to the real complexity (Low, 2013). Working with dilemmas is a second-order process in which the attention, values and flexibility of those involved is paramount. Tackling dilemmas invariably has a mixture of first order information and second order shared reflection.

Dilemmas can be explained as follows. When faced by two mutually conflicting but equally desirable goals, we experience a dilemma. If this is not tackled consciously it can paralyse action, stifle creativity and diminish motivation and goodwill as the forces conflict with each other. Often the dilemma gets polarised into two warring schools of thought, as two sides seek to convince each other of the value of their singular perspective. The dilemma resolution method for consulting (unpublished) developed by myself with Hampden-Turner (1990) seeks to maximise the potential of both arguments and then bring them together into a new, innovative solution. In this process it is essential to depart from *either/or* thinking towards a *both/and* creative resolution that integrates all the best ideas.

What is the underlying structure of a dilemma? Very often in a dilemma we discover one of the conflicting values is based around sustaining an existing performance value that is deeply ingrained and well measured. It is 'rock-like' in two respects. It is considered to be the foundation of success. It is also strongly protected and unmoveable. We discover the other main conflicting values to be based around change, which is somewhat dynamic and unpredictable. This is 'whirlpool-like' in two senses. It is considered to be the essential dynamic that can keep pace with or stay ahead of a changing environment. It is also rather hard to grasp hold of, and uncertain to predict. Note there is some similarity in this approach to strategic assumption surfacing and testing (SAST) (Mitroff and Mason, 1982)

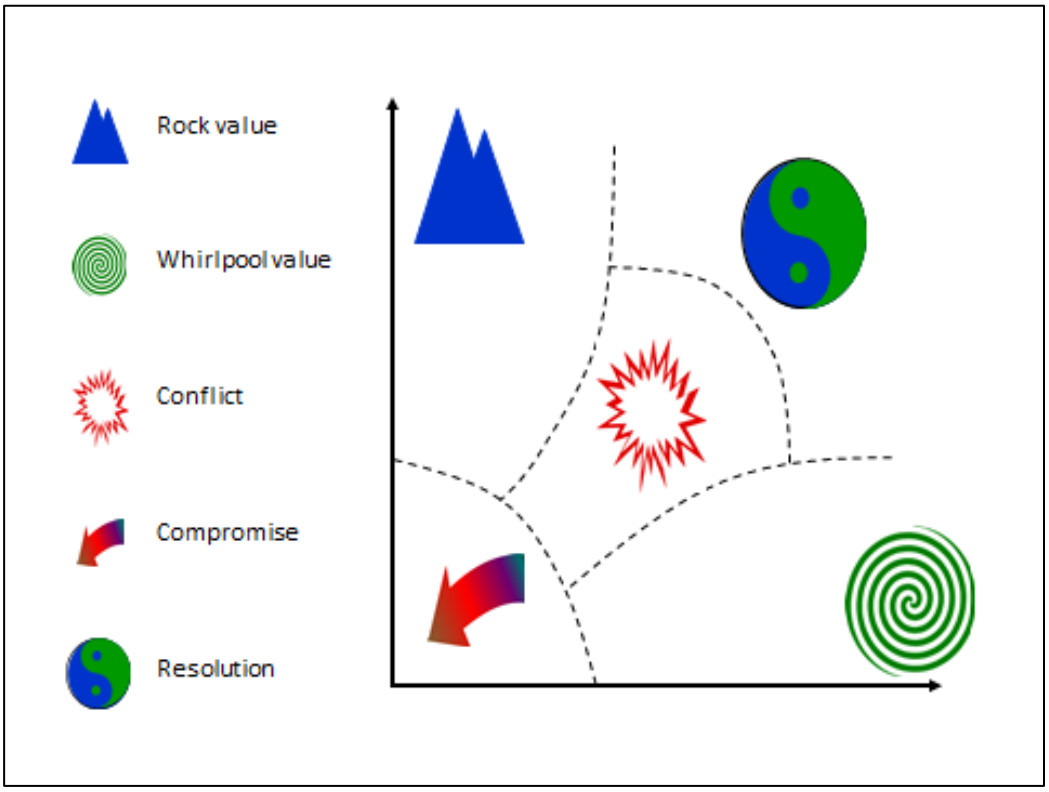


Figure 14.9 The underlying structure of a dilemma
(developed from Hampden-Turner, 1990 by Hodgson, unpublished)

Dilemmas are alive and never still. Wherever the balance is at a given time there are forces of change at work. We have the expression ‘on the horns of a dilemma’ and, using this metaphor, resolution can be interpreted as the challenge of ‘riding the bull’. To ‘seize the bull by the horns’, we need to take the two opposing values and visualise them as orthogonal to each other rather than in opposition. This can be diagrammed as in figure 14.9.

The underlying structure of dilemmas has been deeply analysed by Hampden-Turner (1990), who worked closely with Bateson (1972) on double bind theory. There are five zones distinguished in the diagram.

The Compromise Zone

This is where the tendency is to avoid the dilemma, even deny its existence, or more likely accept a diluted compromise in which neither value dimension gets pursued adequately. The result is a downward or degenerative spiral.

The Top Heavy Zone

This is where the rock values dominate and seem to be satisfied. However the seeds of collapse are in the neglect or rejection of the whirlpool values.

The Lop Sided Zone

As a mirror of top-heavy, this is where the whirlpool values dominate and seem to be satisfied. However the seeds of collapse are in the neglect or rejection of the rock values.

The Conflict Zone

This is where both values are strongly expressed in the situation, but people are unable to reach any creative resolution. Indeed it is a war for supremacy of either rock or whirlpool. The conflict may be protracted (in which case it wastes resources on internal friction) or destructive (in which case it flips to Top Heavy, Lop Sided or Compromise). In these cases, the outcomes are as above. The conflict may also be creative, in which case it becomes a driver for innovation and learning which enables the creation of a whole new situation, discussed below.

The Resolution Zone

This is where both values are expressed even more strongly, but their advocates learn to collaborate and mutually support each other. We get “the best of both worlds”. We have learned to ride the bull and are now benefiting from its tremendous energy.

In a genuine dilemma there is an entanglement between the two values and their associated situations because the dilemma itself is a manifestation of a deeper structure. In fact, the underlying structure is a systemic one in which unseen feedback loops create unexpected consequences. If the advocates of rock values “win” (that is dominate), then at some point in the future the feedback from

the whirlpool realities will catch up and cause defeat. If advocates of the whirlpool values prevail then sooner or later the rock realities will catch up and cause defeat.

The profit/growth dilemma in business illustrates this. Pursuit of short term profit alone exhausts the assets of a company, making growth difficult. Pursuit of growth alone leads to profit collapse. The challenge in resolving a dilemma is to avoid all four unproductive positions: *compromise, top heavy, lop-sided* and *conflict* zones. The creative synthesis or resolution requires mutual accommodation; figure/ground dialogue (where the rock and whirlpool perspectives are alternated); creative thinking and design; facing the conflict zone; and deriving creative power rather than friction from it.

Hampden-Turner (1990) emphasises that dilemmas arise from the highly coupled cybernetic nature of the system which is manifesting the dilemma. This means that the resolution pathway cannot be a simple straight line but will take the form of a dynamic navigation which will oscillate between leaning towards the rock and leaning towards the whirlpool. In figure 14.9, this is related to the dimensional context of the dilemma.

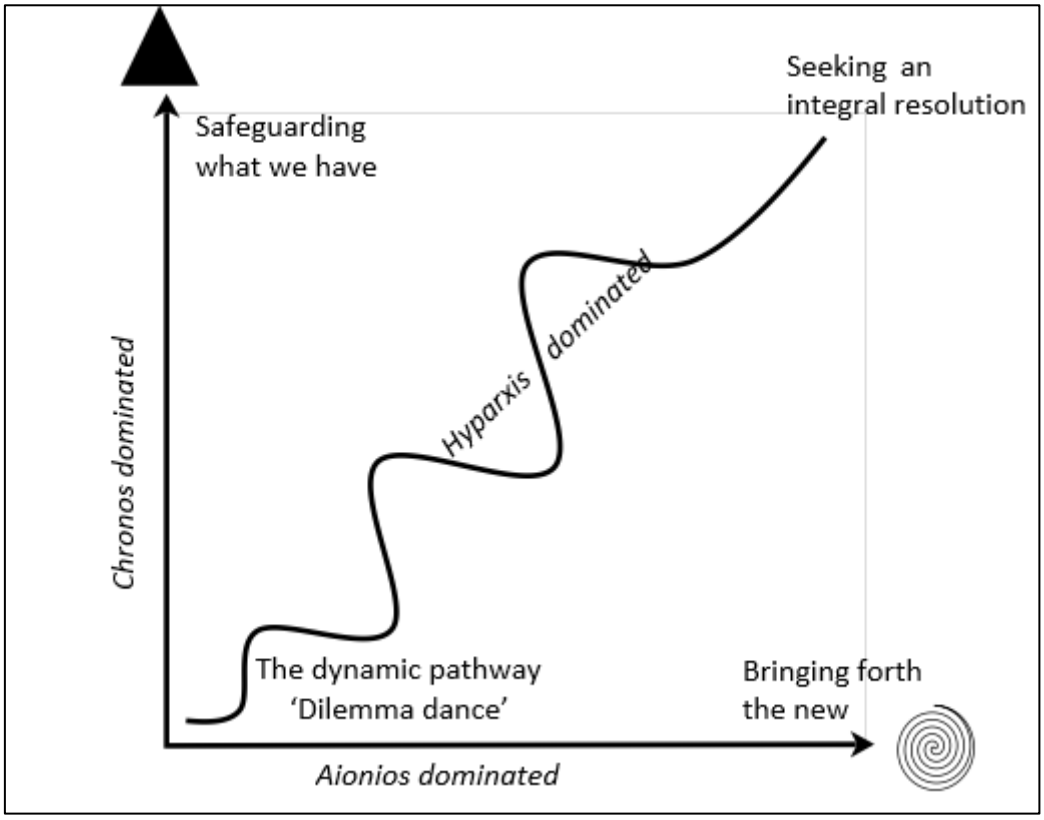


Figure 14.9 Dilemma dynamic regarded through dimensional framing

Usually the rock value is driven by causal momentum and so is largely *chronos* dominated. The whirlpool value is difficult to articulate since it is essentially a latent pattern that is not yet realised, and so is largely *aionios* dominated. The dynamic resolution pathway to seek an integral

resolution (sometimes referred to as the 'dilemma dance') is the continuous balancing and rebalancing of the potential with the actual and is therefore *hyparxis* dominated.

The APM can throw further light on the nature of dilemma navigation. In figure 14.10, the basic elements of dilemma resolution are related to the structure of the APM. Dilemmas can be small or large, and that will determine the corresponding present moment. What needs to be included and embraced to hold the tension? Some dilemmas may be a daily condition; others may be embedded in historical, multigenerational conditions that have yet to be resolved. The dotted circle represents the present moment of this dilemma space. The double headed duration arrow represents the capacity to hold the tension of the dilemma and not escape to one horn or the other. It is the capacity to 'ride the bull'. The feedback link is the reinforcement of what is being held on to, which is the rock value. The feedforward link is the potential for change that is seeking manifestation. The schema function, S, is challenged to develop innovative resolution that does justice to both horns of the dilemma. This requires the capacity to work with both/and generative thinking rather than either/or polarised thinking. The vertical arrows are the work to generate an integral resolution. This is dynamic and needs to constantly re-adjust in a cybernetic manner as represented in Figure 14.9.

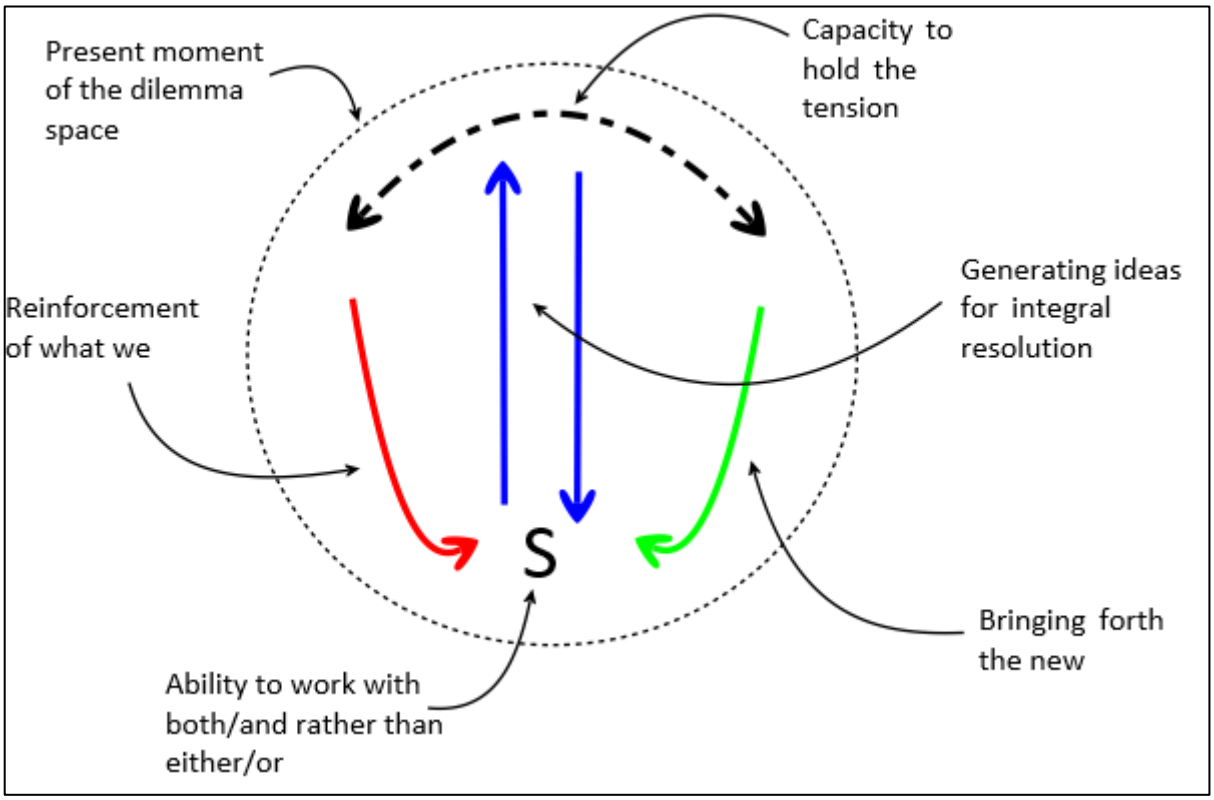


Figure 14.10 Dilemma resolution as an anticipatory process

It is worth noting that Ogilvy's (2011) scenaric stance could be reframed as the capacity to accept both horns of a dilemma and use that tension to generate new insights into the future.

Reflection on Chapter 14

One further exploration that could be carried out arising from the above chapter is to articulate and test out the application of an extended boundary critique that is explicit in its handling of time and time-like boundaries in planning, conducting and reviewing systemic interventions. In this approach the 'sphere of the present moment' would be an anchor concept to the identification of a total set of boundary assumptions.

Another exploration could be some form of integration between viable system modelling and the nature of anticipatory systems. The obvious staring point would be that System 4, concerning the 'out there and in the future', would have a structure and function congruent with the fundamentals of an anticipatory system.

Of particular interest is the proposition that the global problematique needs approaching with the idea of human collaboration that is capable of greatly increasing the requisite variety of the human appreciative system. Fresh ways of increasing the cybernetic variety of our thinking are required, coupled with increased capacity to build different modes of foresight into our collective present moment consciousness. My collaboration with Daniel Wahl (2015) has been greatly supportive in this area.

All this poses intense dilemmas between the Scylla of blindness to longer term implications of decisions and the Charybdis of neglect of immediate survival requirements. I was fortunate in the 1980s to have the opportunity to work closely with Charles Hampden-Turner (1990) on methods of facilitating the resolution of dilemmas based on his deep insight into the cybernetics of how dilemmas are a source of both serious failure and the opportunity for creative breakthrough. His background with Bateson also nourished my growing interest in second-order cybernetic and systems methodology.

The above are just a sample of what might be investigated, since the whole field of systems methods is open to interpretative exploration.

****

Chapter 15: Appreciating the Future

15.1 Landscape of the Future

To relate time to the systems idea it is necessary to go beyond the simple linear, sequential view of time (short, medium and long term). This is especially true where the situation of interest is going through some kind of transformative change. We need to consider the *qualities* of the temporal window of interest. One characteristic of futures thinking is the virtual inescapability of using spatial metaphors for conceiving of extended time. This runs through many disciplines. For example, physics speaks of time horizons and event horizons.

The futures work I have been involved in and contributed to (Sharpe and Hodgson, 2006; Curry and Hodgson, 2007) developed a version of the horizon metaphor to break away from the tendency to treat short, medium and long term futures as linear time.

The three horizons model was originated in conjunction with a scenarios tool, Chicoine's Scenario Impact Matrix (Chicoine-Piper et al, 1997), to explore with a group of corporate strategists different impacts across the short, medium and long term. This provided the equivalent of three settings of a "wind tunnel" to test and develop policies and strategies. What emerged from this experiment was the need to improve the clarity of the qualitative distinctions between the three time periods, so that the changes in structure over time also became clearer, thus affording deeper strategic insight. It also suggested that, under each of the three curves, it was possible to investigate the distinctive nature of the dominant driving system.

The Three Horizons model was adapted significantly to be applied to a UK Government Foresight project on 'The Next 50 years of Intelligent Infrastructure' (Sharpe and Hodgson, 2006). The specific question addressed was how to develop a technology road map over a long period (50 years) where particular technologies could not be described but their likely characteristics could be identified, or at least anticipated. This version of the model, rather than portraying the horizons as successive waves of evolution, characterised all three as existing in the same present moment. In this project the technique was further developed to help address a similar problem in the futures area: the difficulty of understanding longer-run cycles of change, the transitions between them, and the policy questions and shifts which arise at each transition (Curry et al, 2007).

Figure 15.1 shows an example of an application to the challenge of energy transition.

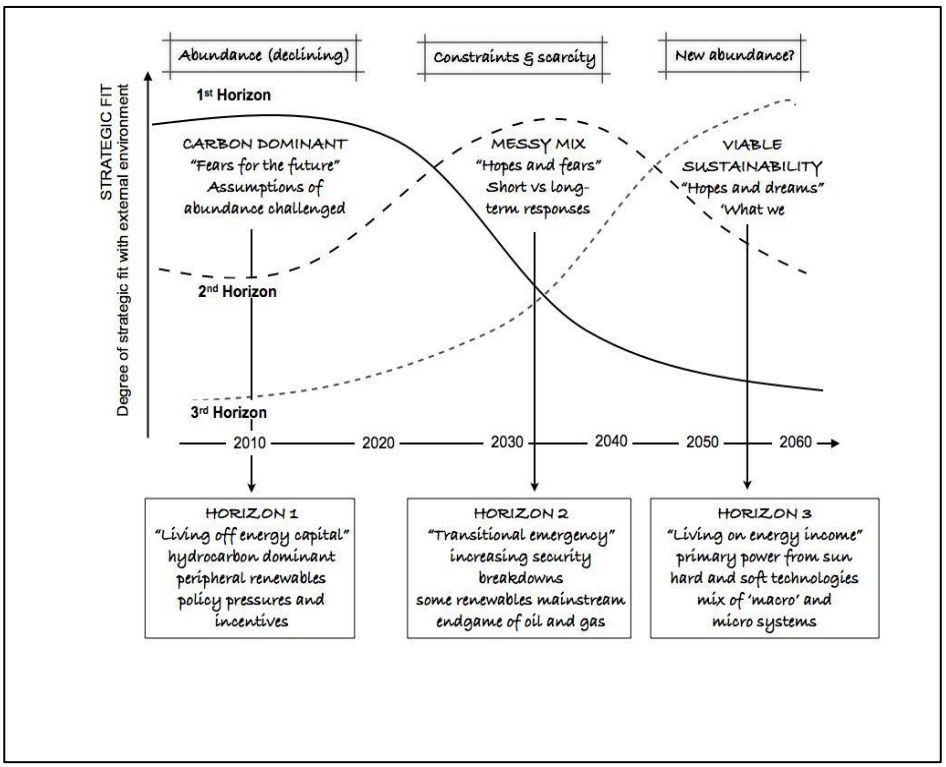


Figure 15.1- Three Horizons and energy security [40]

Horizon 1 is essentially negative. The underlying assumptions of energy abundance which have shaped it are being challenged, even if such views are contested. This creates a space in which change is widely regarded as inevitable, but agreement on the type of change does not exist.

Horizon 2 is the emerging short-to-medium term future, in which we know the limitations of our current position, but do not have the resources to respond effectively; there is little political agreement, the technology is immature but nevertheless attracting some people, and so on.

Horizon 3, in contrast, represents an articulation of a possible future in which these limitations have been overcome. It is a positive view of the future. But it is not a view which is universally shared. Others will advocate competing versions of Horizon 3 (for example, there is a 'nuclear fusion' version, which offers future abundance by a different route).

In other words, as one stands in Horizon 1, one can see around its edges the elements of future Horizon 3 systems. These will include emerging technologies, possible alternative social experiments, and innovative business models. However, these face two challenges if they are to replace the dominant system represented by Horizon 1.

The first is that they need to be better developed and better connected; they need to show that they can work at the required social scale. The second is that their advocates need to win a battle of

[40] This diagram summarises the way in which the Three Horizons approach was applied to the issue of energy security in a paper written for the International Futures Forum (IFF) by Sharpe, Hodgson, and Page (2006).

values about the future system. In Horizon 2 there are conflicts between groups who attach different values to the problem (for example: security of supply vs resilience vs carbon impact vs competition vs price vs control). The information that all groups have about the future is necessarily incomplete, and therefore claims by one group in support of their preferred future are inevitably challenged by others. Horizons 2 and 3 are qualitatively different: 3 is almost ideological, whereas 2 is about negotiating and navigating the practicalities of transition.

The competition between these values are also modified by the values and assumptions which have informed the existing Horizon 1 system, since a dominant system does not vanish, but fades only slowly. These voices are still heard strongly in Horizon 2. For example, in terms of energy supply, the need to maintain security of supply is seen as a political prerequisite. Familiar approaches can appear more compelling, simply because they are more familiar. Successful alternative models need either to be seen as likely to deliver this, or they need to reframe the issue effectively (in terms of supply, for example, by bringing demand management into the conversation).

Such transitions are inherently both messy and riddled with dilemmas. In response to the failing system in Horizon 1, different groups will advocate different developments, and there will be different experiments, informed by different assessments of risk, cost, performance, and social and political values. Some ideas fail, despite having substantial resources expended on them. A new prevailing system does emerge from this complex process, but it is impossible to predict the eventual shape of this system. These are essentially processes of political, social, and public negotiation, occurring within complex adaptive systems with emergent properties manifesting the future.

As outlined above, the axes of the Three Horizons diagram are time (along the x-axis), and level of strategic fit between the organisation or network and the external environment, running from low to high (along the y-axis). The latter can also be assessed in terms of prevailing degree of acceptance of ideas within society as a whole about the political, economic, organisational and cultural norms embedded in an organisation or network. Horizon 1, then, at its left hand end, is the world in which we find ourselves today, and the way in which it is expressed and represented in prevailing discourse. The S-curve tailing away to the right represents the failure of any given model if it does not adapt to external change, which is, of course, a well-understood aspect of open systems theory (Katz and Kahn, 1969).

Horizon 3, in contrast, represents a world (more accurately, one of a number of competing worlds) that is desired by those who propose a different service model, a different political, cultural or institutional framework, or a different paradigm. Looking into the future, then, Horizon 3 represents proposals for transformative change. In the present, such proposals can be thought of as emerging issues, and the evidence for these can be found only in small "pockets of the future" embedded in the present. These might be, for example, manifestoes by campaigning groups, a feasibility study by a research institute, a different business model, or a prototype or field trial developed by a progressive

local authority. In foresight terms, Horizon 3 is a world of weak signals and wild cards, although those who are fully committed to a Horizon 3 vision may not see it like that.

Because of the transformational nature of the change that is sought, the trajectory of Horizon 3 is deeply informed by values and ideals. It fumbles towards utopia, using the only tools which its marginalised advocates have to hand; the power of voice and experiment. It is this relationship with values which makes it a useful scenario testing tool, since alternative scenarios are often informed, or ought to be, by competing values and worldviews as well as by different 'logics' or underlying structures (Inayatullah, 2004).

Horizon 2 represents a far more fundamental conflict of values and of discourse. In the case of energy, there are clear conflicts in Horizon 2 around "green" and "clean", between "local" and "centralised", between maintaining consumption and reducing it, between self-contained energy systems and energy systems which are integrated with other social and environmental processes. The most critical conflicts are likely to include some fundamental dilemmas which cannot be resolved in either/or manner. The dilemma dynamics are explained in the next section.

Thus, the dominant actors in Horizon 1 can hear the word 'green' but translate it as 'clean', and can disregard the components about integration and decentralisation. Their vision for the long-term future of the industry has some consonance with that of their critics (for their existing Horizon 1 model is not sustainable), but the consonance is limited. The outcome is that the world of Horizon 2 is turbulent and ambiguous. It is also possible that the conflict in this space will produce poor social outcomes. The worlds of the successive horizons can be likened to a 'fitness landscape', drawing on the work of Homer-Dixon (2010).

> *"The landscape represents, metaphorically, the range of possible relationships between a species, organism, society, or other complex-adaptive system and its environment. ... The metaphor nicely captures the idea that complex adaptive systems can usually improve their fitness in a number of ways ... the metaphor also illustrates how it's possible to become trapped in a less-than-optimal relationship with the environment."* (Homer-Dixon, 2010, p304).

One of the particular features of the Three Horizons model is that it positions emerging issues in such a way that neither the prevailing or dominant view represented by Horizon 1, or the emergent view in Horizon 3, is privileged. Further, the requirement to understand the structure of the second Horizon, which evolves from the contingent circumstances in which Horizon I is challenged by the new perspectives offered by Horizon 3, means that the values, assumptions, and actors within both H1 and H3 need to be properly understood. This provides an additional way of interpreting Kuhn's (1975) notion of paradigm shift (using this term in a broader sense than just scientific paradigms).

In effect, then, Horizon 3 is constructed as the domain of emerging issues and transformative ideas, and thereby ensures that these are as visible in the process as the more familiar shorter-term

trends which are generally better understood and better rehearsed by participants. It offers a framework which gives permission to think beyond the usual strategic limits without being ridiculed, and also enables participants with competing or divergent views of the future to discover where different viewpoints lie across the three curves, and therefore what conversations between them should be prompted.

15.2 Dilemmas and the Triangle of Transformation

In the three horizons model the shape of the curves of the different horizons effectively defines a triangle of choice bounded by where the first horizon is declining, the second horizon is close to its apex, and the third horizon is still gaining influence. This confronts decision makers with the dilemmas arising from the unavoidable clash of paradigms under Horizon 2.

The triangle of transformation in figure 15.3 occurs in the form of transition where innovation succeeds, whatever the turbulence, in concretising the new paradigms of horizon three. Other variations between the extremes of overshoot and collapse or prolong degenerate are not discussed here.

The details of the innovation and transformation variant are as follows:

Horizon 1 is the continuation of the current successful formula or paradigm, but under duress from a changing context.

Horizon 3, in a normative sense, is the desired future state that best fits the new and anticipated conditions.

Horizon 2 is the innovative trajectory (Christensen, 1997) which is partly a response to fix the 1st Horizon and partly an exploration of aspects of the 3rd Horizon.

Horizon 3 is thus a new order of things in relation to Horizon 1 and is revolutionary. However it may be reached if there is sufficient anticipatory intelligence invested in the transition stage represented by Horizon 2.

The tension between H1 and H3 inevitable sets up a set of dilemmas, as described in Chapter 14, which permeate the character of Horizon Two. To avoid collapse, H1 must be sustained, yet it must also be partially abandoned and radically repositioned to allow H3 to achieve dominance. H3 must be given precedence yet it is insufficiently developed to “take up the slack” of maintaining survival. The cultures, values and mind sets of the two domains are incongruent; it is impossible for them to communicate effectively unless a transitional ground is created to generate new possibilities not initially envisaged by either orientation. The dilemmas that are engaged with in the transitional ground are the determinants of H2.

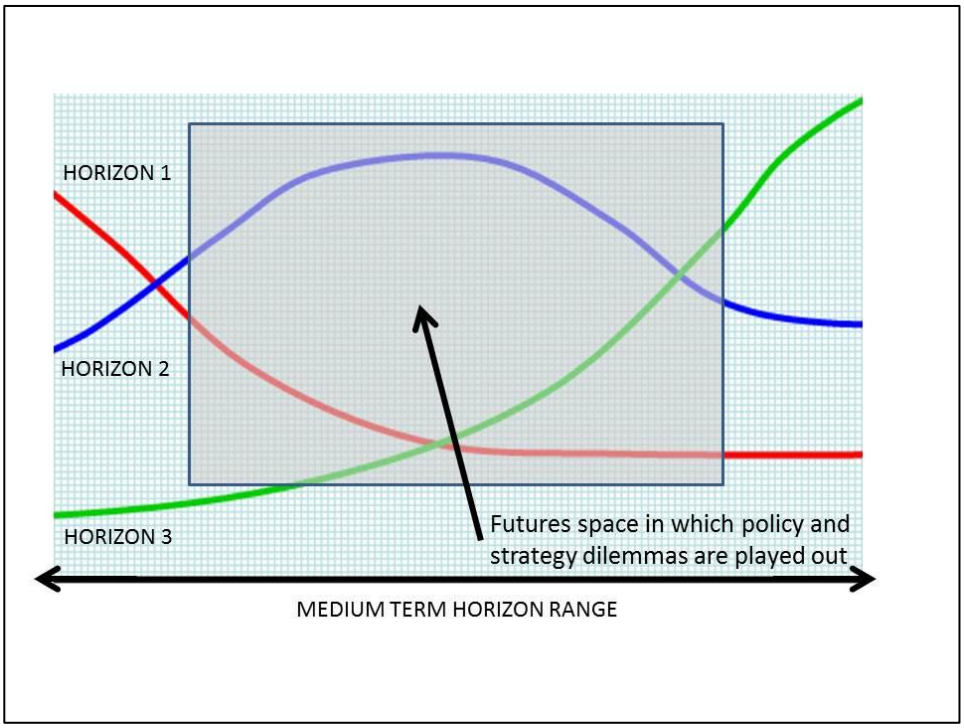


Figure 15.2-The triangle of transformation (detail from the 3H diagram)

The following section builds on the description of the structure of dilemmas in Chapter 14.4. There are essentially five outcomes of a dilemma situation, only one of which is transformational and successful:

Failure modes:

Compromise and avoidance leads to the creeping collapse of H1 – this is the 'boiled frog' scenario (a metaphor commonly used by those wishing to address climate change, as the change is so slow that people can get away with denial until it is already too late).

Dominance of H1 leads to accelerated growth followed by sudden collapse.

Dominance of H3 leads to the abandonment of H1 and the embracing of actions that are not yet sustainable, resulting in sudden collapse.

Conflict between H1 and H3 leads to paradigm wars which may erupt in violence.

Transformational mode:

Generative resolution incorporating positive values from both H1 and H3 lead to transformation in which all three horizons co-exist but with a changing order of significance over time.

This transformational difference can be understood in the context of a view of paradigm shift. We can define transformation as the deconstruction of a given pattern **A**, with properties ***a***, and the reconstruction of a quite distinct pattern **B**, with properties ***b***. We associate pattern **A** with Horizon 1 and pattern **B** with Horizon 3. The intermediate Horizon 2 is of a different character since it is the

turbulence zone in which, and through which, the shift pattern takes place. (The biological metaphor of caterpillar to butterfly requiring the deconstructed chrysalis is a useful metaphor).

Since its introduction by Kuhn (1962) in his work on the nature of scientific revolutions, the word ‘paradigm’ has entered the language as a rather loose and generic term for some kind of change of practice and belief in the community or society. Kuhn himself reflected on the looseness in the use of the word and attempted to tighten up the meaning . Using this language we could say that the three horizons is a way of depicting a paradigm shift. But to understand this more clearly we need to clarify the more rigorous way we are using this term. Kuhn (1962) himself became concerned in recovering this rigour after the term had become popularised:

> *“I might now adopt the notation "paradigm" but less confusion will result if I instead replace it with the phrase "disciplinary matrix"--"disciplinary" because it is the common possession of the practitioners of a professional discipline and "matrix" because it is composed of ordered elements of various sorts, each requiring further specification”.* (Kuhn, 1962, p3).

Kuhn’s emphasis here is on the way that a paradigm is configured by a shared discipline amongst a community of scientists. His use of the term ‘matrix’ points to the complexity in the nature of paradigms which, for example in science, covers a variety of dimensions and suppositions of the discipline. In the three horizons approach we extend this notion to cover an entire society, even an entire civilisation and, in the case of sustainability, the entire social-ecological planetary system. To take this larger perspective it is useful to underpin this idea of paradigms with the deeper analysis of Edgar Morin.

Morin (1999) defines paradigms as "the promotion/selection of master concepts of intelligibility". For example, in a deterministic paradigm a master concept is order; in a complexity paradigm a master concept is emergence. He points out that these master concepts organise the selection of ideas to be integrated into any worldview, and also what is to be refused and rejected. For example, in a Modernist economic paradigm, growth is to be accepted and non-growth is rejected as stagnation and failure. But in a biological paradigm, infinite growth in a limited habitat is rejected and what is accepted is some notion of dynamic equilibrium.

Further, Morin (1999) points out that the paradigm also determines what he calls the “master logical operations", which imply that any paradigm sets out an acceptable form of rationality. Rationality derived from another paradigm is considered irrational and inadmissible.

This seemingly abstract analysis has deeply practical implications where fundamental transformative changes are needed in society. The paradigm designates the fundamental categories of intelligibility and controls their use. Individuals are conditioned how to know, think and act according to these interiorised, culturally inscribed paradigms. In other words, the paradigm has a strong emotional and subconscious power that holds people to dominant belief systems. The relevance of this

to sustainability becomes clear in that the rational arguments of sustainability communities are considered irrational by modernist communities, and vice versa.

> *"The paradigm is both underground and sovereign in all series, doctrines, and ideologies. The paradigm is unconscious but it irrigates and controls conscious thought, making it also super-conscious. In short, the paradigm institutes primordial relations that form axioms, determine concepts, command discourse and/or theories. It organises their organisation and generates their generation or regeneration"* (Morin, 1999, p9).

The paradigm shift and transformation take place in a greater present moment that embraces all three horizons. In conventional terms we say they are simultaneous and they co-exist.

15.3 A Case Example – Strategic Transformation

The triangle of transformation (figure 15.3) reflects itself on all scales of Horizon 2 transitions. Successful navigation of the transition from one regime to another is a process of multiple dilemma resolution; one horn is the essential continuity of some features of Horizon 1, the other horn is the essential discontinuity of Horizon 3. Horizon 2 the transformational turbulence to be navigated.

What follows is an account, from the perspective of facilitating a strategic transition using a designed process which took a group of operational managers through an experience in which they learned strategic conversation whilst innovating a new corporate strategy for their division, part of a major European corporation (Hodgson, 2007). The division in question started as a set of functional islands each concerned with marketing and trading its own related product. Although the division's performance was monitored as a whole by top management, there was no history of efforts at strategic re-positioning. Indeed, the financial performance was so good that there was no obvious reason to embark on a major exercise of strategy work. However, top management recognised that their world of business was changing and that the current business was likely to go through a discontinuity in the not too distant future. However, in the face of unavoidable uncertainty, it was not clear what to do.

A new Division Head was appointed with the mandate to explore strategic options. He recognised that the best chance was to adopt a participative approach involving all unit heads and senior planning staff, and that it require a designed and facilitated process of strategy work. This was underpinned by a strong sense that, in the absence of off-the -shelf answers, a "strategy as learning" approach was most likely to develop competitive advantage through releasing the creative potential of the individuals and developing them into a strategic team. All the individuals in the group were experienced, of mixed age and gender, and operationally very successful.

Through a series of five two day workshops over a period of just over three months, the team were taken through a process that stimulated them to look widely at the business and its geo-political environment, to re-examine their business areas through unfamiliar frameworks that reshaped their mental models, to change their culture from a functional structure with stove-pipe reporting to a team culture with strategic conversation, and finally to arrive at a concerted integration of the different

business lines into an overarching strategy based on a newly evolving business model. In this process the availability in the company of deeply researched scenarios developed over two years was significant, in that the wider economic and geo-political environment had been well studied by a corporate strategy group. The facilitator (myself) had been the consultant project leader for this global scenario work.

What follows is a more detailed description of the process in relation to the way the facilitation and practice methods helped to navigate the team's thinking through dilemmas as described in section 14.4 and avoiding as far as possible the four modes of failure in a dilemma situation. The role of cognitive frameworks, the practical exercises to internalise them, and the changes of perception, evaluation and motivation they brought will be characterised in the context of five fundamental dilemmas. The grey boxes in the text below contain a cross reference to the cognitive skills pertinent to dilemma resolution which received most emphasis around this stage of the process. Of course, any of them may come in handy at any point if the symptoms warrant it.

The challenge facing the team leader was how to refresh a high performing unit which seemed likely to be trapped in an economic bubble that was unlikely to last more than three to five years, and hence would likely become the victim of its own success. However, because of excellent performance, there were no operational reasons for engaging in a major revision of strategy.

- Questioning the status quo
- Recognition and acknowledgement of complex messes
- Graceful entry (see section 9.1)

This starting point made them vulnerable to the trap of being caught in fixed strategic beliefs. Further, the team leader was new to the unit and had only partial expertise in the range of businesses in it. He therefore needed a highly participative approach that would stimulate the creativity of the group.

Dilemma – Simplicity/Complexity

The first dilemma resolution task was to dislocate constructively the current business model and place it into a new context for strategy work, thereby opening up the scenario space. This meant loosening the certainty in their current operation and plans. Using a scenario approach immediately would be premature. The preparation was to have each business leader present their picture of the next ten years of performance, but have the team raise any questions about those plans. The 'sequence of information' trap tends to confine thinking to a fixed pattern corresponding to the way the plans are presented. Their cross-questioning was deliberately not answered immediately, but recorded and clustered to give a shared "map of doubts". This provided a loosening up of the thinking of the group which was self-generated, drawing on the inherent diversity of the group. Many of the questions raised were about assumptions of the future. This acts as an antidote for the single loop learning trap by shifting the thinking towards the second learning loop of reworking assumptions (Argyris and

Schon, 1978). This provided a more responsive platform for, next, a preliminary introduction to a set of three global scenarios that had already addressed some of the trends and uncertainties and provided the first exercise in expanding the group's "memory of the future". A key framework introduced here was the distinction of levels between mission, strategy and tactics, and how these levels change understanding of current operations.

- Constructive expression of doubt
- Assimilation and experimentation with new frameworks of thinking
- Tolerating initially anomalous information

Dilemma - Certainty/Uncertainty

The second dilemma resolution task was to open up to a more complex future than had so far been considered, developing a richer picture of possible changes over different time scales and introducing progressively greater levels of uncertainty about the world of business. The scope of the group's own thinking about the future was stretched so that they began to own the future thinking aspect of the scenario components. Although the plans were cast in a ten year horizon, it was clear that there were no discontinuities in their reading of the business environment and so they we in danger of falling into the 'time horizon extrapolation trap', which involves treating ten years as one year ten times over, with small incremental changes across these. This should not be assumed. The three horizons method was used at this point (see Section 15.4 for a full account). Meanwhile, here is short sketch.

The rolling hills of the first horizon are the current business conditions or "business as usual". Next the foothills of the second horizon represent the innovations that challenge the first horizon with disruptive technologies and business models. The third horizon is the higher mountains which represent a complete change in the business ecology. The third horizon is beyond being able to predict any given technology or societal arrangement. However, it is also the domain of values and visions and hence the future time period in which the first horizon values might be displaced. This depends on how far the first horizon mindset captures the innovations of horizon two or how far the disruptions are exploited by the longer term vision. For example, the transition from an unsustainable energy economy to a sustainable one is open to question in how the tension between energy security and climate change might be resolved.

An important cognitive point here is that each horizon is associated with a different mindset and associated belief system. Mature strategic work is able to acknowledge all three horizons and switch between them at will. This is very hard for people not practiced in taking on world views different from their own dominant belief system. It is analogous to multi-future thinking with a scenario set. However, the framework is also effective in giving people

permission to step outside the box of orthodox linear projection and entertain peripheral observations about what is going on and where it might lead. In this case the exercise led a number of members of the group to recognise the bubble nature of the current business as usual. The motivational level of the group increased significantly at this point.

- Unearthing and articulating assumptions and beliefs
- Populating frameworks with self-generated materials, ideas and facts
- Reframing or re-perceiving both present and future

Dilemma - Knowing/Intuitive

The third dilemma resolution task was to make an experiment of stepping from the known rational to the unknown intuitive. By supposing that the second and third horizon conditions of the business environment they had speculated about might indeed be the case, they asked the question "what kind of a business idea would be successful in that environment?" This led to a number of ideas around opportunities, value creation and distinctive competence that were in marked contrast to the initial presentations. At this stage there was little conviction that they were where the team needed to go, but they had significantly expanded their thinking, and a recognition that the current strategy was vulnerable was well established. This was particularly emphasized by the exercise of asking which competitors were most likely to adopt something like the new type of business idea. Indeed, it was then recognised that some were already doing it! This further strengthened the motivation.

This was now a somewhat unnerving situation for the group because they had mentally abandoned their current strategy as sustainable and yet had only speculation as to what the alternatives might be. This is where they were most in danger from the 'intolerance of ambiguity' trap. However, this was also a point where premature closure to get out of the tension could have shut down the process. To counteract this, the dilemma framework (Hampden-Turner 1990) was introduced. This looks at the contrast, even incompatibility, of the first versus the third horizon, and formulates them as dilemma pairs that need resolving in the second horizon. This "both and" inquiry set up a strong field for creative thinking and some initial dilemma resolution ideas began to hint at possible new strategies.

Up to this point the earlier introduction of the three global scenarios had been left hanging in the background. This was already bearing some fruit in that members were reporting current information that indicated 'pockets of the future in the present' that had previously been unnoticed. Before focusing on the development of new strategy, however, it was important to revisit the well researched global scenarios and focus them into the transaction zone. This began to deal with the 'reactive versus proactive' dilemma. This is the area where the scenarios shift from the domain of 'outside our influence' to 'where we might make an impact'. The current business lines were primarily product oriented and it was becoming clear that, in the third horizon, the business model

would need to be much more multi-product service focused. So four distinct market areas were designated and the team tasked to create focused scenarios in those areas consistent with the global scenarios. The process researching the transaction zone revealed the scenarios in strong relief and, by the end of this exercise, they had become effectively internalised and the relevance to the business unit was incontestable. This meant that the potential for effective scenario impact on strategy development had been created. The group now had constructed a shared "memory of the future" (Ingvar, 1985), but as yet there was no clearly formulated strategy to challenge with the scenarios in any wind-tunnel method (van der Heijden, 2005).

- Cognitive repriming to change the pick up of relevant information
- Reframing or re-perceiving both present and future
- Generating new Ideas of opportunity and strategy

Dilemma - Reactive/Proactive

So the next step was to create a sketch strategy, much as an architect creates a sketch building. This stepped firmly into the heart of the 'planned versus emergent' dilemma. They had firm operational plans for several years ahead with committed deliverables, and yet they had, at the same time, to explore a completely different business model and a strategy to reach it. The framework used here was the strategy map. The team gathered round a long and large sheet of paper, the length of a board room table. One end was designated the present and the other around three years into the future. The idea was that the big changes in business model could not be discontinuous since the value generation by the current business must be sustained as long as the bubble lasted. So the strategy had to reflect the patient but urgent planting of the seeds of strategic change. The framework here was a dynamic strategy in which the present and future business models would have to be run in parallel and a timed transition managed. The table map was then populated with ideas for action on both business models, working backwards from the future. The impression at the end of this stage was a promising but somewhat incoherent bunch of ideas which didn't seem to hang together.

The next step was the introduction of strategy as storytelling. Strategies too are stories of "how we won", told before the battle. The team leader was challenged to place himself three years ahead and, looking back, tell the story of how the strategic transformation was now clear and well on track. As he put it, this was an act of will as well as creative synthesis. The result was a shift of energy and realisation as the team saw a pattern of strategy emerge from their ideas that became convincing and coherent. Of course, there were many rough edges, but the analogy here is that strategy work at this point was treated as a design process rather than an analytical one. The rich pictures that people had built up over the preceding stages now became a solid and arguable base for the new thinking.

Dilemma - Planned/Emergent

The strategy map was now further refined and some gaps filled in. Major threads of market position, business model and support infrastructure were clarified and these now became the strategy

input for interaction with scenarios to help generate options (Ramirez, van der Heijden and Selsky, , 2008). This was carried out in each of the three focused scenarios. The thinking task was defined in three layers – testing, developing and innovating. At the end of the process, the team realised that they now had a shared strategy in a common language that they had all developed together; they had integrated sustaining business as usual with transforming in readiness for a changed competitive environment; they had rehearsed the major challenges likely to be thrown at them by top management; and they had created the platform for a further six months of strategic analysis to ground the ideas in current and anticipated realities. They now had integrated the planned and the emergent.

- Mapping complex connections that articulate strategy
- Visualising and narrating stories that reveal an unfolding logic and dynamic strategy
- Mutually connecting ideas and analytics for testing and verification

In my consulting experience the crucial factor in working with dilemma method is the cognitive one. In summary, navigating the triangle of transformation requires the mental skills of holding in mind seeming opposites whilst allowing scope for creative insights to emerge that offer new angles on how the transition might be accomplished.

15.4 Three Horizons in the APM

The APM provides another interpretative lens for explaining the power of the three horizons as a facilitation tool. Firstly the perspective from the multi-dimensional vireo s considered, then the anticipatory systems aspects. This analysis builds on the material in Section 14.4.

Each horizon in the model emphasises a different aspect or 'cut' through the present moment (See Figure 12.1) . The three horizons can now be seen to relate to the different dimensions of the present moment as described in Chapter 12 (See Figure 12.1).

The APM perspective is represented in Figure 15.4. The Horizon 1 state, which is dominated by the current paradigm, emphasises momentum in the sense that causes (C_p)[41] and forms (A_p) from the past dominate the trajectory and hold their power from the autopoiesis (H_p) of those forms. Any disruption to this state will tend to be dealt with in a resilient way under the basic idea of 'bounce back'. Anticipation tends to be dominated by the attempt to eliminate uncertainties and construct predictive futures.

[41] C_p – *chronos* past; A_p - *aionios* past; H_p – *hyparxis* past. See Figure 12.1

The present moment is enriched by the creation of a Horizon 3 State, which is essentially an ideal future. As yet unrealised possibilities (A_f)[42] indicate options and possible choices (H_f) and openness to the possibility of future to past influences (C_f). The emphasis is opening up the space of possibilities and potential beyond the constraints of Horizon 1.

As we saw from the earlier discussion of paradigm change, the greater the difference between the nature of the Horizon 1 pattern (determined by momentum) and Horizon 3 (determined by a transformed pattern), is the 'transformation gap'. This is occupied by the Horizon 2 pattern (inherent possibilities), which is characterised by a capacity to manifest a selection of these possibilities (H_f), from the total range (A_f) while also responding to the emerging future (C_f).

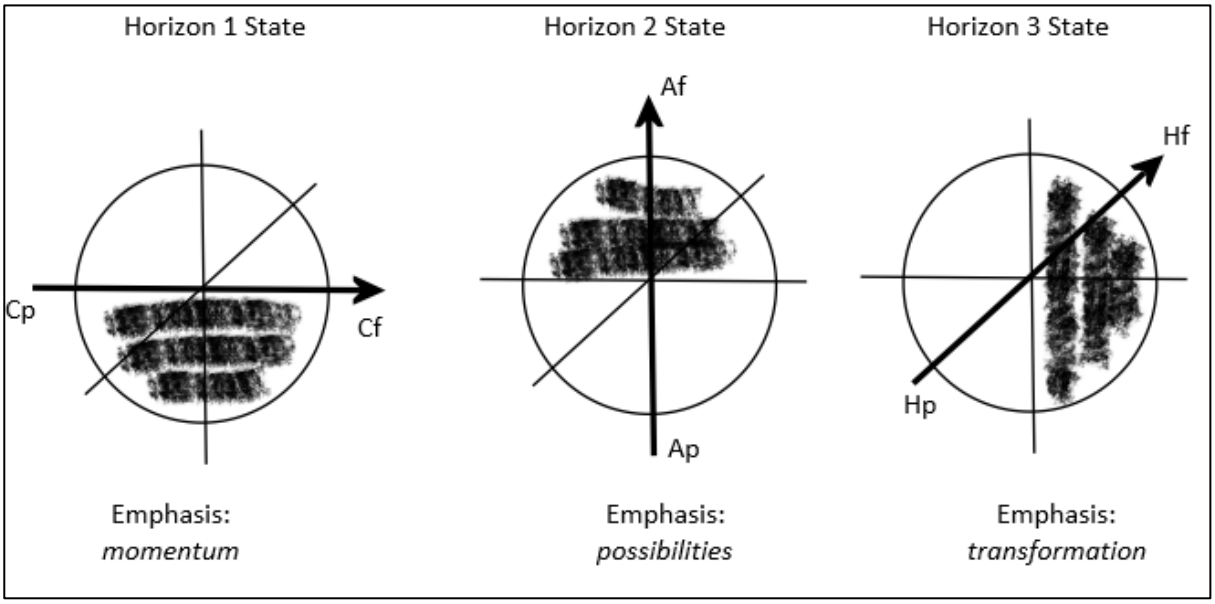


Figure 15.4 Three Future Horizons and their relation to the dimensional framing of the present moment

From the dimensional framing above we can now look at the way the three horizons relate to the anticipatory present moment (APM). The scope and scale of the present moment relates to what in linear terms has been called 'time span capacity' (Jacques, 1956, 1988). This will determine the level of recursion of the three horizons perspective. A key question to set a level of recursion is: is this focussed on change on an organisational scale or it is focussed on a complete change in industrial structure? Around this focus the person or group considering the three horizon perspective will need to determine where their boundary state is; that is, what is to be included and what is to be excluded. Range and boundary state are indicated on figure 15.5, which is a simplified version of the APM.

[42] C_f – *chronos* future; A_f - *aionios* future; H_f - *hyparxis* future.

The significant component of the horizon one momentum is the feedback that enables anticipation based on experience and history. The significant component of the Horizon 3 potential is the feed forward that introduces factors from the future that go beyond experience and history. The horizon two realisation, which is the effective aspect of anticipation, is the intelligent interaction between the schemas and the perception of the present moment.

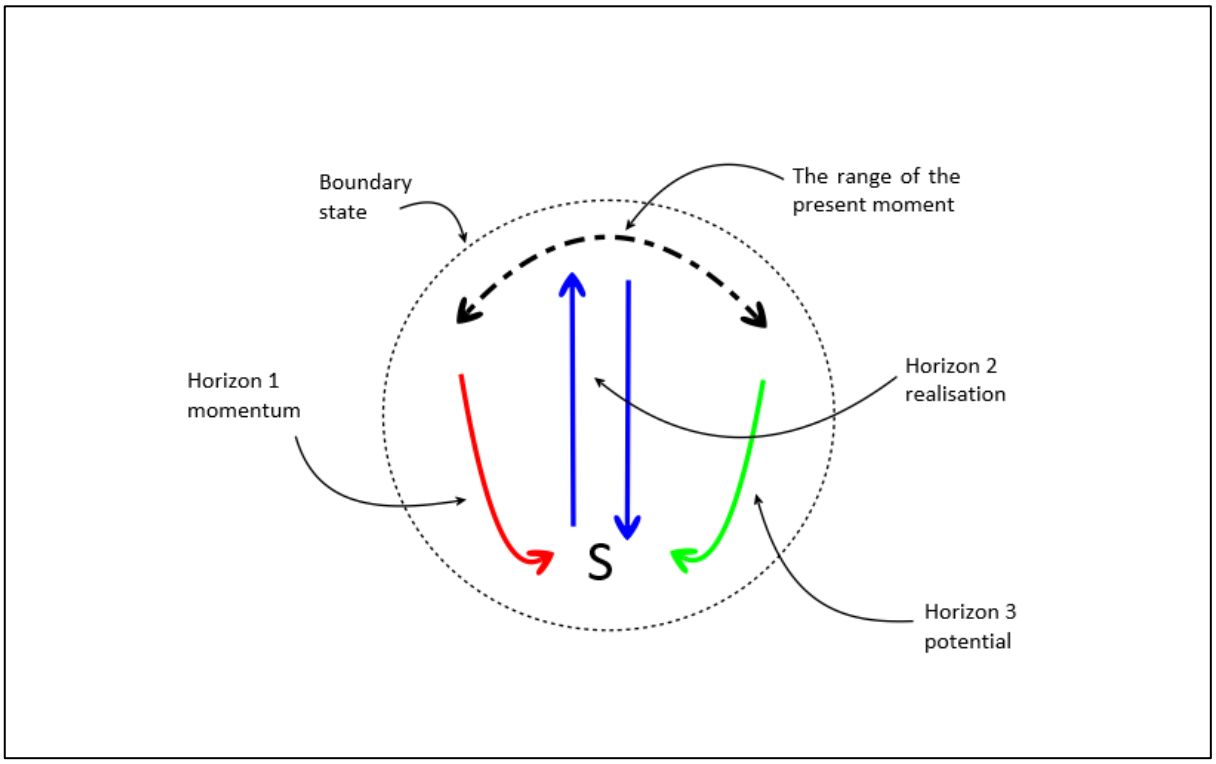


Figure 15.5 The relationship of the three horizons to the APM.

One of the aims of the practice of foresight based on the three horizons is the cultivation of a future consciousness (Sharpe 2013) that is active with high agency and able to navigate uncertainty. The three horizons model gives us a way of describing a landscape of the future and, combined with the APM, indicates more depth in the way that future consciousness is structured. As we shall see in chapter 16, this theoretical view has interesting implications for the practice both of systems methods and of foresight.

Reflection on Chapter 15

Recent conversations (July – September 2015) with Bill Sharpe exploring the further implications of the three horizon method have raised some interesting interpretive questions concerning the notion of how second-order foresight might be structured as a practice. A provisional idea is based on the observation that Horizon 1 tends to emphasise the 'out there' perspective. The strategic fit of performance is seen to have peaked and is declining. There are various measures of this and the pathway into the future has strong deterministic components, along the lines of Wack's (1985)

notion of predetermined elements. If we keep pumping greenhouse gases into the atmosphere there will eventually be significant changes in global climate. However, Horizon 3 tends to be related to the orientation and values of the decision maker. In this domain there are contested values carrying different visions of the future across a spectrum of 'might happen' and 'make happen'. Horizon 2 is often a muddled area of mixed assumptions from the paradigm of Horizon 1 and the paradigm emerging in Horizon 3.

One interpretation of this in the context of second-order science is that foresight in the context of present moment theory is an integral view that combines the observer excluded perspective of first-order science with the observer included perspectives of second-order science. Practices based strongly on this approach would address the common issue in decision support with future thinking, that cognitive bias tends to over-rule balanced consideration of possible futures. This is shown in the way that even though futures work opens up the decision field, the Horizon 1 decision power tends to close this down prematurely often determined by defensive routines (Argyris et al, 1985). Combining three horizons mapping with the anticipatory present moment theory could contribute to a more 'foresightful' way of shaping and taking decisions.

****

Chapter 16: The Mindful Practitioner

16.1 Time, Pattern, Perception

This chapter explores the possible implications of the anticipatory present moment, APM, for enhancing the way we use systems and futures thinking for strategic decision making. Considering the nature of the future leads to the idea that the *present moment* has additional dimensionality beyond chronological time. Considering the nature of systems leads to us privileging of *pattern* as fundamentally underlying any system; systems are not the only manifestation of pattern. Considering *reflexivity* in both futures and systems thinking leads to perception being a crucial aspect leading to a need for second-order science. Further, concern for the implications of the above three considerations for decision making leads to the integration of these aspects summarised as *time*, *pattern* and *perception* with the notion of *anticipation* – thus the emerging idea of the anticipatory present moment (APM).

The practical implication of this is a new approach to the practice of decision making which is second-order in nature, and which places the decision maker inside the decision system (unlike analytical decision support), acknowledges that the state of the decision maker (observer) is crucial and will colour the interpretation of any information in the decision field.

> *In preparing some ground for the development of a more integrated theory to support futures thinking and systemic intervention I have followed a pathway from the simple assumptions of time's arrow and linear causation to a complex notion of the present moment with non-linear feedforward and synchronous causality. This pathway also adds to the epistemology of how we might* know *the future and the ontological question of what* is *the future.*

We need a consideration of both the anthropology of time and the anthropology of causality :

> *"In short, I believe that the time-anthropology of the future must be open-ended, eclectic, empirical, neither subservient to the prestige of the scientific method, nor so paranoid about science as to fail to see the virtues of objectivity, logic and soundly-based argument, lucidly set down on paper." (*Gell, 1992, p328).
> *;*
>
> *"Causality is one of the core concepts in our attempts to make sense of the world, and the explanations we come up with shape our judgments, emotions, and intentions. This renders causal cognition a core topic for social as well as cognitive sciences. In the past, however, respective research has been split into diverging paradigms, each pertaining to a distinct (sub-) discipline and focusing on a specific domain, thus creating a rather fragmented picture of causal cognition. Furthermore, most of this previous research paid only incidental attention to culture as a constitutive factor. Yet, cultural variation can be expected with respect to the delineation of domains, the concepts referred to, the mechanisms of processing, and even the willingness to search for causal explanations. A systematic and thorough investigation into the cultural constitution of causal cognition is thus overdue, and it will have to relate research on the conceptual level to novel accounts of action perception, of agency construal, and of comparative research on development and across species."*
>
> (Bender and Bellow, 2011, p1).

In both the futures field and the systems field there are many approaches that assume a linear nature of time and uni-directional causality implying there can be no influence on the present from the future. These approaches can range from various types of prediction through to the dominant use of the concept of driving forces in creating scenarios of the future. Causation becomes more sophisticated when the notion of cycles is introduced. This is particularly evident in economics such as the Kondratieff cycle. Such cycles become more complex and can lead to exponentials, explosions and bubbles. Feedback enters the interpretation and leads to the concept of trend breaks or tipping points. The behaviour of the players in the market introduces a reflexive layer which is driven by the players perception of each other's playing.

A transition step in the development of my thinking here is to acknowledge the importance of anticipatory systems in which such a system incorporates in some way a model of the anticipated future that prompts action not based entirely on the past. We have added to feedback the notion of feedforward. The notion of acting from signals of anticipation moves us from driving in the rear-view mirror to working out what lies behind the windscreen. To face a future, laden with potential, possibilities, uncertainties and the ambiguities of reflexivity by simply having a set of scenarios is inadequate. Ogilvy's (2011) idea of the 'scenaric stance', in which we entertain both heaven and hell in equal measure, sustains a capacity of direction and choice in the face of ambiguity that is closer to the anticipatory present moment.

In the second-order stance we are now dealing with an agent, the decision maker, who can be purposeful, intelligent and creative. Miller (2011) points out that this is a stance which acknowledges our need to entertain unknown, creative possibilities and seek multi--criteria outcomes. At this point we cannot go further if we avoid ontological questions. Bergson (1910) provides us with a philosophy that separates the direct experience of time and space from the manner in which we describe it intellectually. We are now also in the domain of second order cybernetics.

Poli (2011) goes further to affirm that we need to enlarge our notions of dimensionality and consider an ontology of the future. To further this I have introduced the little-known work of Bennett (1966) who proposed a multi-dimensional notion of the present moment. The essence of this view of the present moment is that in our experience of now, the so-called flow of time is only one of three major determining conditions of the future. We must also include the aspect of latency, pattern of potential or in my more technical language the dimension of *aionios*. Likewise, we must also include the aspect of commitment and freedom to choose, which allows for the creation of possibilities, and which is referred to as the dimension of *hyparxis*. In summary, the future is contained in an emerging present moment determined in the dimensions of *chronos*, *aionios* and *hyparxis*.

These concepts of multidimensionality are very much in the tradition of western thought. It is worth a brief reflection on how for this is biased by my own experience as a white male European

based in the traditions of science and management that are prevalent in western culture. Especially in the matter of second-order perception there is no escaping from a background with limiting and conditioning boundaries. However, it would be an oversight not to indicate that many of the ideas discussed here are not unique to western science. It could be that the potential of this way of thinking about time requires different ways of knowing. (Rajagopan, 2016)They appear in different guises in several cultural traditions. An example to illustrate this is the following passage from a commentary from Tibetan Buddhism on the nature of reality.

> *"From the perspective of Tantra we are two-dimensional in our vision of the world. But the tantrika lives in a three-dimensional world – a world of sumptuous creative fluency. These dimensions are the three spheres of being, and an understanding of them is fundamental to the practice of Tantra. These three spheres of being are called chö-ku, long-ku and trűl-ku. These terms are so exorbitantly rich in meaning that it is not possible to give them concise one-word equivalents in Western languages – our vocabularies are simply not adequate to the task. However, as a starting point, we can relate to them as emptiness, energy and form.*
>
> *chö -ku – emptiness – is the sphere of unconditioned potentiality*
> *Long-ku – energy – is the sphere of intangible appearance*
> *trűl -ku – form – is the sphere of realised manifestation."*
> (Chogyam, 1995, p49).

16.2 Four Modes of Anticipation

I will now review the way that the concept of the anticipatory present moment has created a perspective in which systems thinking and futures thinking coalesce in present moment thinking. Systems thinking in isolation is about a state domain and futures thinking in isolation is about a time domain. This view has been expanded by considering pattern to be a fundamental aspect of the state domain within which the various systems concepts and methods sit. A distinction is made, mentioned earlier, between the 'thin' present moment and the 'thick' present moment. The former is the more-or-less instant now, a slice of chronological time whereas the latter is extended in its time span by retention (distinct from memory) and protention (distinction form imagination) more richly endowed with content distributed in space and the three time-like dimensions. The present moment is itself a notion of second-order science in that it is centred ion the experience of an observer. The 'objective' content of the present moment is in presence to the 'subjective' experience of the observer/scientist/decider.

This structure, which was described in some detail in Chapter 12, modifies the way we interpret what we are doing when we apply systems thinking or futures thinking, especially when combined as a means of decision support. Understanding the systems in question and understanding the future are now two perspectives within the same focus of attention.(See Figure 2.7) This requires the present moment to have a dynamic structure that integrates retention, protention, pattern, perception and anticipation. The processes of information generation from the past (feedback) make possible adaptation but not genuine anticipation. Effective anticipation requires processes of receiving

information from or about the future which are not fully derivable from the past. The expanded content and dimensionality of the present moment does not exclude influences from the future informing choice.

Information concerning the future which is beyond feedback adaptation is of different kinds.

1. *Surrogate Information on the Future*

   This is illustrated by the creation of 'images of the future' which are dislocated from imagined futures based on trends and extrapolations, thereby introducing some new aspect that can be anticipated and affect present decisions. This explanation is favoured by those who reject any view that anticipation has features beyond linear causality.

2. *Retro-causality*

   This suggests that patterns of existence unfolding over time have an ingredient of causality distinct from that coming from the past. This idea is largely restricted to the quantum scale world and is not considered relevant to the macro world on the scale of human affairs. However, recent research in quantum biology is proposing that there are mechanisms whereby quantum effects can trigger changes that work through to the macro-behavioural level. Living beings may well have access to this kind of foreknowledge.

3. *Future consciousness*

   This form of anticipation is plausible if we accept the cosmological view that human mind is participating in a universal mind which is whole and unfragmented. This was postulated at one level by Bohm (2003) as the holomovement and at another by King (2006, 2014) as field of the consciousness (also see Rajagopalan, 2016). Since the present moment is a function of conscious self then this view accommodates a wide variety of nested present moments (see Figure 12.2). In this view for a larger present moment the future of a smaller contained present moment is already present in consciousness. What will differ is the distribution of significance in the six-dimensional continuum of space-chronos-aionios-hyparxis.

4. *Future making*

   To the extent that we are creative agents we can imagine futures that have not yet come about, that would be unlikely to come about without intervention, and bring them into being. This view depends on the present moment being open and the impact of choice being beyond mechanical causality. This gets us into the knotty area of relating free will to the present moment. However, the introduction of the sixth dimension of hyparxis is a way to accommodate the additional 'degree of freedom'

needed to allow for spontaneous generation. At the human level this is the power of visualisation coupled with commitment to make something happen.

These four ways of considering anticipation at the human level are all potential features of the anticipatory present moment. I say at the human level because it is emerging from more transdisciplinary review that anticipation is a universal phenomenon that operates on many levels of reality (Poli, 2007). This is a field in which second-order science could be challenged to develop a more universal perspective than the anthropocentric.

Anticipation is also a behavioural property of a system. A key generic model of this is the original version of Rosen (1985) (See Figure 10.1). I have indicated in Chapter 14 that the systems view of anticipation could be enhanced by bringing this into relationship with the viable systems model of Beer (1985) (see Figure 4.3). In this sense the anticipatory viable systems is a meta-system for other systems methods which seek to enhance understanding and effectiveness of intervention to increase viability, especially through paradigmatic change. Thus the anticipatory present moment from a systems perspective can accommodate methodological pluralism in the systems sciences. The implication is that just as boundary critique is a meta-systemic method for any systemic intervention so APM can be a meta-systemic method for any strategic decision.

16.3 Perception within the Present Moment

The concept of the multi-dimensional anticipatory present moment implies that its content or 'thickness' can be at least partially known in all its aspects. This presents a problem for first-order science which makes its main stay the production of rational causal explanation in the absence of an observer, in the sense that every observer would see the same thing, making the need to account for an observer perspective redundant (Midgley, 2000). The implication is that if the present moment can be known in its richness then the rational mode of knowing on its own is insufficient. Rajagopalan (2014, 2016; Rajagopalan and Midgley, 2015) has proposed an extended paradigm of knowing in the field of systemic intervention. This approach can also be applied to the issue of knowing the present moment.

Rajagopalan and Midgley draw on the work of Heron and Reason (1997) in an extended epistemology. In their scheme the rational approach is one out of four modes of knowing. The four modes are:

Experiential – is direct immediate perception of a situation through being present in the situation. This mode of knowing is congruent with enactive perception as described in Chapter 9.

Presentational – is essentially symbolic expressed in aesthetic creation and design that captures and expresses meanings within the experience of the subject. In this context the observer is not passive and detached but active and participative.

Practical – is know how expressed through a skill and competence and accomplishes a realisation of the meaningful content of the present moment. Although most easily recognised in the

production of artefacts it can also apply to performances and more abstract expressions, such as mathematical theories.

Propositional – is knowing conceptually and descriptively depending on conventions of language and symbolism regarding a view of reality. This is the dominant way of knowing in first order science.

Each of these ways of knowing access different aspects of the present moment. My proposition is that to cultivate the capacity of anticipatory present moment all four modes need to be brought into play. This requirement can be related to the six causes depicted in Figure 12.6 which is reproduced with annotation again here

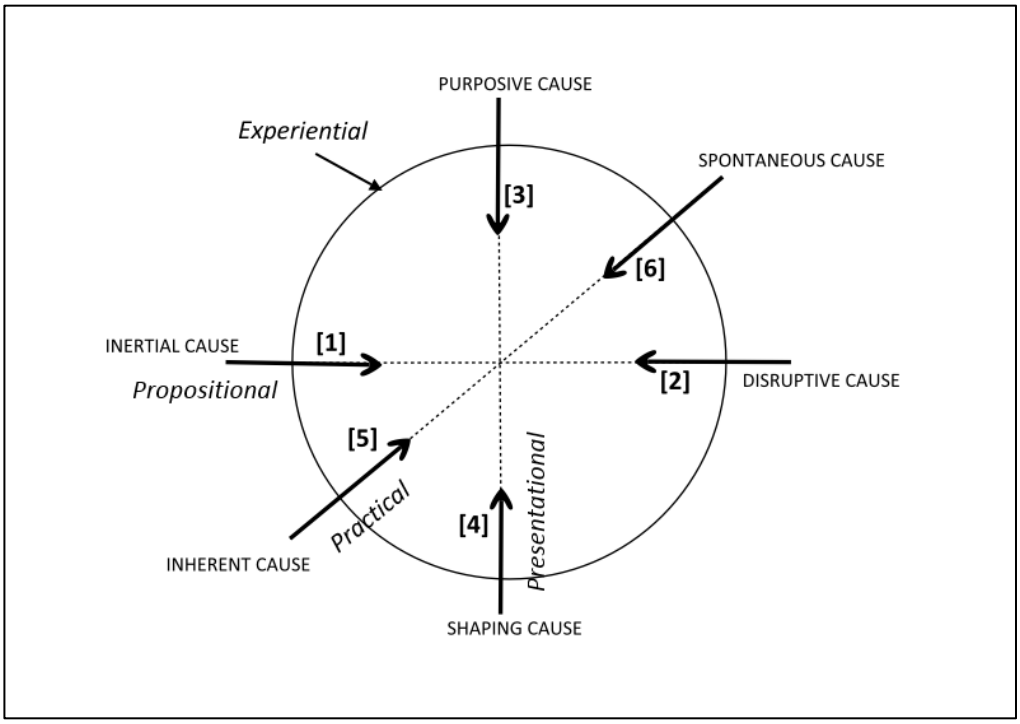


Figure 16.1 Four ways of knowing and the six-fold causation of the present moment

Although there is not a simple 1:1 correspondence between the ways of knowing and the dimensions of the present moment, there is sufficient correlation to suggest that each way of knowing offers a perceptual window that picks up on one aspect of the present moment more strongly than another. In Chapter 12 the case was made that the fundamental basis of the present moment is experience. No experience, no present moment. This experience is the complete sphere of the present moment. Propositional knowing is the basic method of first order science based on notions of *causality*. Presentational knowing is the recognition and creation of *patterns*, intuitive in their source but manifest in the forms they are given. Practical knowing is the substantive realization of the potential pattern in the time stream of the present moment.

The implications are that the capacity and effectiveness of the anticipatory present moment will partly be a function of how all forms of knowing are brought into action. This offers another

practical way into realising second order science. A conscious present moment implies an openness to the richer dimensions and content through receptive presence. This leads us into the practice of mindfulness. In second order science the state of mind of the observer/scientist/decider is a factor in what is perceived and how it is appreciated as relevant. The mind can be compared to a radio receiver that can have extremely limited or extremely wide bandwidth. Mindfulness practices are emerging as a way to expand and 'tune-up' the mind receiver. This is well summarised by the psychiatrist Epstein (1995).

> *"With the mindfulness practices comes a shift from a spatially based experience of self to a temporal one. Having accomplished a certain amount of inner stability through concentration, the meditator is now able to look more closely at the moment-to-moment nature of mind and self. Mindfulness involves awareness of how constantly thoughts, feelings, images, and sensations shift in the mind and body. Rather than promoting a view of self as an entity or a place with boundaries, the mindfulness practices tend to reveal another dimension of self-experience, one that has to do with how patterns come together in a temporary and ever-evolving organization."* (Epstein, 1995, p142).

The question of the state of mind in relation to doing science was a key contention between Goethe and Newton. To Goethe the human being is the primary instrument of science as summarised here by Naydler (1996).

> *"In so far as we make use of our healthy senses, the human being is the most powerful and exact scientific instrument possible. The greatest misfortune of modern physics is that its experiments have, as it were, been set apart from the human being; physics refuses to recognize in Nature anything not shown by artificial instruments, and even uses this as a measure of its accomplishments."* (Naydler, 1996, p29).

In Goethe's view the emergence of first-order science and the Baconian 'power over nature' was a misfortune. The history of science since then can hardly be called a misfortune, as it has delivered real benefits for humanity but it is clear that the divorce of observer from observation is now leading to a backlash from the very Nature over which control was sought. A rebalancing through second-order other ways of knowing is perhaps long overdue.

16.4 The Absence of Second-Order Science as a Conceptual Emergency

We are part of this world, not separate from it and so of the same nature. When we rationalise ourselves and our world we are asserting something which at best is of limited consistency with how things really are. The perverse consequence of this is that the more we assert we understand the world, and so limit what we do, the more we find ourselves living with the unintended consequences of our decisions.

The above view can be applied to the individual, the group, the institution, the nation and the globe. From a management perspective we focus on the institution or organisation. Organisation

management, dominated by the management sciences, has analysed and systematised situations to bring them under control to pursue goals such as "return to shareholders" or "public value"

However, the real world leaks out from the boundaries of rationality, springs surprises on us and confronts us with uncertainties. Indeed, on occasion, the world smashes through the very centre of institutional life and destroys jobs, companies, industries and even whole economies. Control should then be seen for what it is, a convenient half-truth (Leicester, 2007).

The kind of decision making that dominates in the "controlled world" does not match the behaviour of the "uncontrollable world". Effective decisions cannot be arrived at by rational analysis alone because the latter is an inherently limited method/perspective. We need the half-truth this generates but we need an approach to deal with the missing unruly half. As well as being ignorant of the future we have poorly developed capacity to anticipate the future.

Some thinkers and practitioners have made efforts to create alternative modes of perception, analysis and decision making more congruent with this unruly world beyond the veneer of socio-economic rationality. The International Futures Forum (Leicester and O'Hara, 2009), sums up its foundational work in addressing these issues in a text called *Ten Things to Do in a Conceptual Emergency*. This puts forward ten strategies that offer prospect for working towards the other half of truth not accessible to rational analysis. The following subset of five principles, summarised below, suggest a change in orientation that is fundamental to giving second-order science a possibility of developing. It is clear they are not in any way pervasive in contemporary society. The headings which follow in italics are taken from Leicester and O'Hara (2009). The summaries under them are my own.

Give up on the myth of control

We have taken our ever more sophisticated models as a proxy for reality. But our models break down in the face of the real complexity and mystery of the world.

Trust subjective experience

The implications for how we see the world and our place in it are critical for our understanding of it and our behaviour towards it and, more profoundly, as part of it.

Form and nurture integrities

The traditional model of organisation is struggling; start by replacing integration with the more flexible and adaptable notion of integrity.

Re-perceive the present

We underestimate the importance of living more deeply and consciously in the present. We need to extend our habits of what counts as 'knowledge'.

Move beyond and enlightenment consciousness

The subject-object split is the hallmark of the Enlightenment, the separation of self from the world. We need to recognise a new context.

In a conceptual emergency it is necessary to take a different approach both to science and to decision making than the one which dominates the current paradigm in both science and management. Poli (2010) points out that complex wholes (super complex systems) are irreducible: their fragmentation loses information. Analytical methods fail to work even for individual cases. Since in indecomposable wholes are not entirely understandable from their parts, the manipulation of parts may produce unexpected consequences (note the similarity of this with the idea of unintended consequences as defined in systems theory) (Fortune and Peters, 1995).

The new possibilities of second-order practice depend on the practitioner himself or herself being able to exercise a capacity for a kind of consciousness that is better able to spot the unhelpful assumptions behind many of the usual ways of tackling the future and pick up traces from the six dimensions of the present moment.

In practice this places considerable demands on the practitioner since he or she will have a mentality that frames experience and information in certain set ways. These are termed framing traps (Rossel 2010) which constrict our present moment. The challenge is to develop greater flexibility in entertain different interpretations, even worldviews. There is some value in developing this capability to consider the benefits of an approach termed meta-framing (Rossel, 2010). Meta-framing is the identification of what has made a given frame possible in the first place and how it has been actually produced so as to increase alertness when it is acting as a framing trap. Meta-framing in anticipatory thinking is more likely to be sensitive to possible disruptive shifts in the cultural or paradigmatic sense. Meta-framing may also improve our capacity to deal with wild cards and therefore to increase our resilience. Meta-framing applied in the context of present moment theory would therefore considerably enhance the reflexive component of examining the present moment in all six questions of dimensional framing (See section 12.3).

16.4 Anticipatory Mindfulness

The ultimate aim of the transdisciplinary journey of theoretical synthesis of futures thinking and systems thinking is to return to the practical experiences that led to the identification of the research question in the first place. Like the uroboros we need to bite the tail and complete the cycle. This leads to how systems thinking, foresight and systemic intervention might be practiced differently. An arena for this practice is the field of decision support. Papamichail et al (2007) describes this as follows.

> *"Decision workshops, sometimes called decision conferences, help a group of decision makers gain a shared understanding of a decision problem, analyse issues and commit to an action plan under the guidance of an experienced facilitator…… A framework for studying facilitation practices emerged. The effect of a facilitator on the structuring of the problem, the group decision process and the outcome of the workshop was studied. The results of the work indicate that a facilitator's style and approach to the workshop may have*

> *an impact on the action plan devised. Further research is required to generalize the findings of our work".* Papamichail et al (2007) p614.

As a very practical aspect of his research into similar questions of practice Rajagopalan (2014) immersed himself in learning in apprentice mode long established traditions of music and sculpture in India. Combining personal reflection and dialogue master teachers, he arrived at some working conclusions to be further researched. These are that their teaching approaches, which can appear indirect, repetitive and even vexing to the Western learner are actually effective in their working on the self-awareness of the student as well as the operational skills of making music or carving stone. In summary traditional learning of this type:

- Deepens the student's capacity for learning in the four modes described above
- Leads to conscious awareness of which mode is in use and even being able to deliberately choose a mode
- Gains a feel for the interplay and cycling between the modes that enables deep learning and more effective practice.

Rajagopalan and Midgley (2015) speculate on the implications this may have for improving, even rebalancing, the practice and education of systemic intervention and I would add also for anticipatory present moment practice for foresight.

> *"We fear that, unwittingly, the sacredness ascribed to rational knowing in the systems community could generate strong taboos about other forms of knowing, keeping them forever on the margins of systemic intervention and thus preventing us from knowing and learning more about our world. Importantly, there is a danger here of a false evangelism masquerading as an emancipatory and participatory approach. Quite possibly, if perhaps ironically, people who possess only non-literary knowing may provide us the seeds for integration of the 'enlightened' and 'shadow' sides of our culture, at both the social and individual levels. Socially, for example, there may be clues about ways to address problems created through the dynamics of our modern economies, such as the ecological crisis; and individually, those without literacy might help to put interveners in touch with their deeper selves that they may be only dimly aware of."* (Rajagopalan and Midgley, 2015, P559).

Once the barrier to exploring the second-order role of the facilitator/practitioner is broken then fresh methods can be explored and tested. Such an exploration is not part of my own research here and represents a potentially large field of future interest (Sharpe et al, 2016 forthcoming). Much is now being gathered and codified in such relevant fields as mindfulness, creativity, precognition and even remote viewing. But the idea that these would be part of mainstream education of systems thinkers and foresight practitioners is some way off. There are still barriers as Morin (2007) points out.

> *"Imagination, illumination, and creation without which the progress of science would not have been possible, only entered science on the sly. They could not be logically identified, and always were epistemologically condemnable. They are spoken about in the biographies of great scientists, but never in manuals and treaties, whose sombre compilation, like subterranean layer of coal, was constituted by the fossilisation and compression what initially*

were fantasies, hypotheses, proliferations of ideas, inventions, and discoveries." (Morin, 2008, p34).

The following section describes two qualitative experiments that introduced the potential for the creative factor 'on the sly' as Morin puts it above. However, this was done with the full cognisance and collaboration of the participants. The first took place in November 2014 with a small group (fifteen people) convened by International Futures Forum from a variety of backgrounds in administration, arts and sciences. The second took place in May 2015 also with a small group of post-grads from the University of Dundee and St Andrews University convened by the Centre for Environmental Change and Human Resilience (CECHR).

16.5 Experiments in Mindful Anticipation

Experiment 1

The experiment was a guided visualisation based on the dimensional structure of the present moment as presented in Chapters 11 and 12. The aim was to step from the conceptual (or propositional way of knowing) in to phenomenological approach reflecting on here-and-now experience. The whole exercise took about half an hour and took place in the mid-afternoon. The stages were:

1. *Collected state*

This is analogous to what has been called the relaxations response [43],[44]. The aim is help people come to presence, relax and free up their attention from immediate preoccupations to some degree.

2. *Presence through breathing*

Attention is given to the breathing[45] without any attempt to control the pattern. Usually there is a further natural relaxation of the breath increasing sensitive awareness.

3. *Visualise this morning's breakfast*

This places the attention about six hours into the past. Although memories are triggered this also evokes a sense of retention in the Husserlian sense.

---

[43] This is a mindful state somewhat analogous to the relaxation response.

https://hms.harvard.edu/news/genetics/mind-body-genomics-5-1-13 accessed 16/10/2015

[44] *"The relaxation response is a physical state of deep rest that changes the physical and emotional responses to stress... and the opposite of the fight or flight response." Mind Body Medical Institute, http://www.relaxationresponse.org/* accessed 16/10/2015
"The simple discipline of concentration brings us back to the present moment and all the richness of experience that it contains. It is a way to develop mindfulness, the faculty of alert and sensitive awareness."
https://thebuddhistcentre.com/text/mindfulness-breathing accessed 16/10/2015

4. *Presence through breathing*

This comes back to the centre of the experienced present moment.

5. *Visualise tomorrow's breakfast*

This stretches attention into the future by a few hours and links two 'breakfast events' as one whole experience. Although imagination is used there is also evoked a sense of protention.

6. *Presence through breathing*

This again comes back to the centre of the experienced present moment. Steps 3-6 stretch the awareness of time as whole as well as indicating a sequence.

7. *Become intensely aware of this room and its contents including people*

This now shifts from time to space and the forms present in that space.

8. *Presence through breathing*

This comes back to the centre of the experienced present moment.

9. *The potential of this event*

This draws attention to what is for the people in the room latent and might emerge from the experience. This is the latency or aionios experience.

10. Presence through breathing.

This comes back to the centre of the experienced present moment.

11. *A past event of significance that contributed to your interest in today*

This invites connection to a meaningful experience of the past which is alive in the mind and has let to participating in the event.

12. *Presence through breathing*

13. *To what are you drawn in the future?*

This is inviting the attention to open and even creative possibilities which have a feeling of attraction and even mystery. This is the hyparxis or active participation aspect of the present moment and is its strongest anticipatory aspect.

14. *Presence through breathing*

This comes back to the centre of the experienced present moment.

15. Collected state

This preliminary exercise was not set up to provide any rigorous 'before and after' review but to stimulate informal discussions with the group after the experiment. The discussion was confidential but indicated some changes of perception and some insights. Members of the group involved in theatre found it liberating in considering their a science fiction project. Others reported insights into their own personal pathway into the future.

Experiment 2

This took place with a group involved in research related to environmental concerns and sustainability. The exercise was different from Experiment 1 but it was still based on the present moment structure of Chapters 11 and 12, especially the diagram in Figure 12.8 which is further reproduced here for ease of relating to the experiment. As a practicing consultant I had experience of using the Shell Seven Questions approach (see Section 13.1) and wished to try an analogous direct questioning approach based on the diagram below as an anticipatory dynamic tool analogous to the Shell questions.

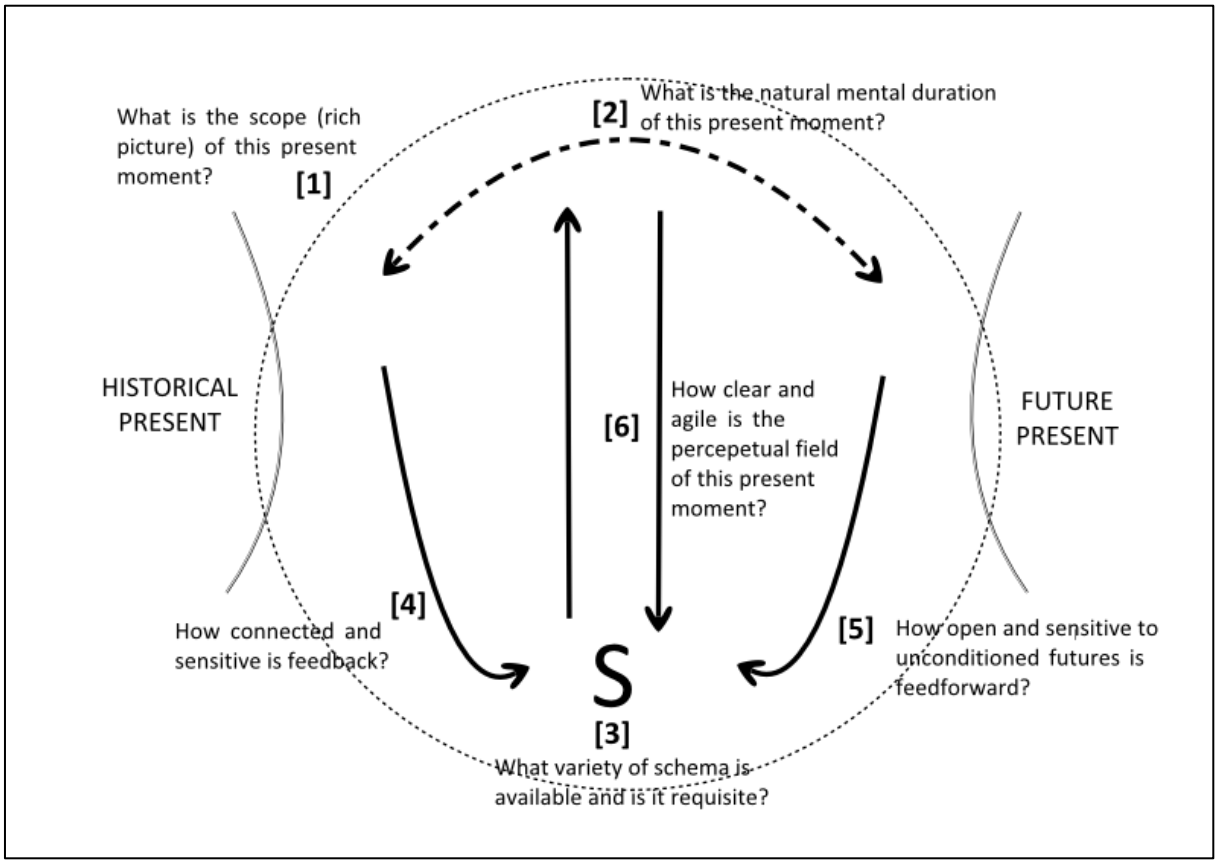


Figure 16.2 Anticipatory Dynamic Tool (c.f. Figure 12.8)

The focus of the exercise was anticipating Urban Life in 2050, a challenge to extend the sense of present moment by 35 years into the future. The experiment was in three phases

Phase 1 – Initial speculative thoughts on the 2050 future of urban life?

Phase 2 – Seven Anticipatory Questions based on the model in Fig. 16.2

Phase 3 – Reflections on comparing the output with the initial picture of Phase 1

A sample of responses is given in the Table 16.1.

QUESTION	*SOME PARTICIPANTS' THOUGHTS*
1 What is likely to come about by momentum from the past?	• Technological advancement • Division, tribal groups, competition, conflict, expansion • The future as defined by past power holders • Extensive migration into cities
2 What seems to be new not coming from the past?	• Widening our perceptions (who are we? Who is with us?) • Sense of cosmopolitan global society, "de-othering" • Changes to the environment that were unforeseen and not predicted in the past • New forms of simplicity
3 What is a positive potential beyond the above events?	• Reduction in material needs • Reducing conflict between groups • Resistance movement to counter the movement of the past into the present and then the future • Shift from economic centres to learning centres
4 What tangible forms are likely to dominate?	• Peace, abiding to rules that are set from our past (learning the lesson!) • Global social integration • Powerholders based on material and economic wealth • Concentration of city power
5 What has the most promising life in it for the future?	• The promising life would be living, earning your living with decency and consciously • Increased global integration and awareness moving away from historical patterns of tribalism, competition and resulting conflict • Imaginative possibilities for a new direction • Neighbourhood communities – nested autonomy
6 Can you see/sense/imagine a desirable outcome that would be surprising?	• Solutions for all current problems (medical, economic, etc.) • New clean energy sources run by a new institutional system • No surprise imagined • Cities become sustainable within planetary limits
7 What now is the essential value of this future in the present moment?	• Our children and future generations • Present moment can be a departure point from past patterns towards a novel future` • The potential of how the present could look in the future if nothing changes n how the future might look if we depart from the present ways of thinking about urban governance, and so on • Hope; friendship

Table 16.1 Responses to the Dimensional Framing Questions

A number of points came out of the discussion in Phase 3. Some key reflections from the group are: "maybe our ways of designing the future are based too much on fear of failure rather than freedom of success"; "Acknowledging the subject – how to do that in a mindful way?"; how does the future influence the present?";"it enriched my picture"; "fleeting images with my children in them";

"appreciating time span". There was insufficient time available in the event to share a deeper discussion of these observations and their implications. This could be a useful piece of further research if done with different compositions of groups.

Reflection on Chapter 16

The potential these small experiments illustrate is that practitioners, whether researchers, consultants or facilitators might be able to enhance their practice by adopting a second-order approach based on the theory and background of the anticipatory present moment (APM). This could be enhanced by complementary experiments with different settings for carrying out the work (Williams et al, 2014). The enhancement implies bringing together into *powerful definite practices* (Sharpe et al, 2016 forthcoming)

1. Information – being grounded in the known
2. Re-perception – opening up new possibilities in the unknown
3. Attunement – being open to other ways of knowing
4. Imagination – entertaining previously hard to imagine possibilities
5. Creative Synthesis – bringing a valued future into the present

The two experiments are, of course, only small excursions into this territory and indicate the potential value of further practice research. Aspects of this approach have also been applied in a project on policy development of carbon pricing (CDP, 2015). The outcome is a radically different approach to policy which stresses the dynamic navigation of policy dilemmas through a series of [pricing bandwidths rather than a 'one size fits all' global strategy. Each decision agent needs to find the appropriate pathway for their reading of their specific location in the context of the global picture.

So although this research study has been essentially theoretical it leads to the possibility in further work of creating practices which increase the match of methods and skills in foresight and decision to the real world of complexity portrayed in Chapter 1.

******

Chapter 17: Conclusion

As described in the *Introduction and Overview* my research was initially prompted by the following questions which are repeated here for ease of the reader.

1. What positive contribution might systems thinking make to better frame the nature and methodology of scenario and futures based strategy work in business, governance and community resilience?
2. What positive contribution might scenario thinking make to the nature and methodology of systemic intervention in business, governance and community resilience?
3. What aspects and developments of epistemology and ontology can help shed light on the nature of both futures thinking and systems thinking, in terms both of positive potentials and also critical limitations?
4. What might a new metatheory of strategy formation look like which integrates the learning from the above three questions?

First of all I will give a narrative account of the process and evolution of the investigation in terms of the engagement with the content of the chapters. However, in that process the significance of second order-science as an over-arching positioning of this work emerged. So secondly I will review the work from the perspective of a recently published perspective of a general methodology for second order science (Muller, 2014).

My investigation of the literature background to these questions was cast in the context of the view that we have moved from a complicated world to a complex world (Chapter 1). The properties of complexity correspondingly require complex thought. The form of complex thought central to this research was the relationship (or absence of it) between systems thinking and futures thinking or foresight (referred to frequently as futures studies). A search of the literature (Chapter 2) looked for evidence of futures thinking in the context of systems thinking and the converse, systems thinking in the context of futures thinking. Although there is evidence of both these taking place, relative to the mainstream of tools techniques and practices it seemed pretty clear that my original intent in the above questions, based on over 30 years of practical work in the field of corporate organisation and business development, holds up. It seems that there is only a weak basis for addressing questions [1] and [2] (Chapter 3).

Moving on to question [3] my interest moved to the idea of reflexivity both in the context of systems and in the context of time (Chapters 4 and 5). In Chapter 4 a case is made to reframe system as a special case of pattern, where the generic idea of pattern gives more potential space for considering the integration needed for the task of synthesis. In Chapter 5, a reframing of the nature of the future, that is to say of time itself, is made based on a development from Husserl's

phenomenology of time consciousness. These two reframings then enable a step to be made in Chapter 6 of proposing an approach to synthesis where both system and time are treated from perspectives different from the usual ones.

What became increasingly clear, as I deepened my research, was that the respective paradigms within which most systems thinking and futures thinking takes place were incompatible hence, with those assumption sets, integration was problematic. Put simply, normal science requires *evidence* in which the presence of the observer is theoretically eliminated; *imagining* futures, especially those of strategic interest, involves visions for which there is no evidence, or scant inferential evidence, but there are explicit observer perspectives that make the visions meaningful. It became clear that to effect a synthesis it was necessary to reframe both thinking about systems and thinking about time and the future (Chapter 6). These perspectives were deepened with considerations of the physics and phenomenology of time. Since this raises some radical questions about the nature of time and causality, I then made an excursion into theoretical physics and cosmology (Chapter 7) which indicates that, though not mainstream in physics, there are serious thinkers who posit that time is richer and more complex that basic clock time and even the relativistic space-time continuum. Notions of retrocausality and the future influencing the present are not ruled out. A spectrum of views exists between the thermodynamic irreversibility of time's arrow to the notion that time itself is an illusion, with many alternatives in between.

This led me to question the nature of time and dimensionality drawing on my early experience of many dialogues with Bennett (1956) about these questions. The idea of extending our notion of time to include additional time-like dimensions is an area I have further explored in an ontology of the present moment (Hodgson, 2013). The introduction of this as a key concept provided an important step in the thesis (Chapter 8). A distinction is made between the 'thin' and the 'thick' present moment with the latter compared to the notion of the present moment developed by Bennett. The position of a decision maker in the midst of this way of looking at things is developed as a decision system in which the participation of the decision maker is crucial. The terse argument by von Foerster (1995) that algorithmic decision making is not truly human decision making is a critical transition point here.

However, the present moment needs to be interpreted as a dynamic and active state of perception where, in discovering strategic or policy advantage, it is necessary to keep seeing the world in new ways. The term, *reperceiving* (Wack, 1985), is taken as the core idea at this point. The nature of reperception was explored through three different approaches, namely in induction, creativity and enactive cognition (Chapter 9). This strengthened the significance of reperception as a process whereby the mental conditions determining the scope of the present moment and how it can be repatterned and becomes open to the possibility of powerful anticipation.

All of the above steps led me to consider how reflexivity invites a change to the nature of systems science from a first-order science ("In no way shall the observer enter into the observation".

von Foerster, 1995, p1) to a second-order science ("Anything said is said by an observer". Maturana, reported by von Foerster, 1979, p1). I had already explored this in an earlier piece of work on decision integrity and second-order cybernetics (Hodgson, 2010). This view needed extending now to include a promising but, until recently largely neglected, concept of the anticipatory system (Rosen, 1985; Poli, 2010). This prepared the ground for taking a second-order development of the anticipatory system concept (Chapter 10). To assemble the ingredients for a synthesis, a recapitulation (Chapter 11) was made to make clear the transdisciplinary challenge. What needed weaving together was the phenomenology of time experience; the scenaric stance from recent thinking on scenario methods; the ontology of the present moment; the role of extended boundary critique; the nature of anticipatory systems and the role of inductive reperception. By integrating these several perspectives I came to the integrating concept of the *anticipatory present moment* (APM) which is the core of my thesis (Chapter 12). The essential features of the APM address, above all, research question [4] and are:

- The phenomenology of time experience which anchors the APM as second-order
- The nature of anticipatory systems which integrated foresight and action in the present
- Boundary critique which establishes the scope of the present moment of interest
- The ontology of the present moment which enriches the dimensionality under consideration
- The scenaric stance which keeps open the unresolved future
- Induction and reperception which enable the psychological shifts that open up to previously unperceived factors affecting the future and, further, the influx of creativity

These features are integrated in a dynamic model which extends the model of the anticipatory system in a way that can accommodate the role of the subject in determining the performance of the system.

To begin testing out the model, the concept of the APM was applied (Chapters 13, 14 and 15) to a number of problem structuring methods and systemic models to see how far it could evoke an extended interpretation of how those methods work and how they might be enhanced. These were thought experiments shared in small groups to see where viewing these methods through the lens of APM might explain or extend their significance.

This investigation (Chapter 13) then developed my study of decision integrity and second order cybernetics (Hodgson, 2010) in which I describe a view of decision making based on von Foerster (1995) and Reichel (2008). I find the concept of the APM enhances the meaning of 'decision integrity' which seeks to integrate the factual systemic side of decision making with the values-ethical side, both of which are referred to by the word 'integrity'. Three contrasting further applications are then to be found (Chapter 14). An important connection was made early on (Figure 11.5) between boundary critique and the present moment. This was further expanded upon in section 14.1 to extend the notion of boundary not only in terms of space and context but also in terms of time span.

Especially of interest is the recognition that, in reconciling different stakeholders in a systemic intervention, it could be useful to use a version of the APM to help mutual appreciation of the way the differing parties experienced their sense of the future and what the range of their possibilities are. Section 14.2 took the self-organising version of the viable system model, VSM, (Espejo, 2000, Espinosa et al, 2011) and considered how the reflexive nature if the APM could enhance people's self-awareness of the shared system giving the sub systems 1 to 5 an additional context for mutual understanding. It appears that possible mappings between anticipatory system modelling and the structure of the VSM might add another approach to the need for effective inter-communication between system 4 and system 3 (Beer, 1994). Section 4.3 examined the structure of a game to engage with global complexity, the IFF World Game, (Hodgson2011, 2012) through the lens of the APM. The reflexive nature of the game was clarified using the APM, showing that gaming invokes a second-order perspective on the world systems model. This would not occur if the model were to be treated as simply an abstract concept to be learned.

The final application study (Chapter 15) focussed on a way of developing foresight called the three horizons which is open to second-order interpretation. This way of framing thinking about the future is particularly relevant to where an anticipated future change is radical – a paradigm shift. The transition from one paradigm to another goes through a turbulent phase of deconstruction and reconstruction that is inherently dilemma ridden. This is known as the triangle of transformation. A case example highlighting the cognitive challenges of dilemma thinking illustrates this. In the original work that this draws on (Hodgson, 2007), five basic dilemmas of futures work were identified.

The work now cycled back (Chapter 16) to address research questions [1] and [2] with regard to the practical implications. Although this is a theoretical study it has been undertaken in the spirit of "there's nothing more practical than a good theory" (Lewin, 1952, p169). The theory of APM clearly suggests the possibility of practices that differ in many respects from established methods. Two qualitative experiments were described that open up the exploration of this new territory. In my experience of foresight and strategy consulting there is a long incubation time between the idea and the established practice but it is my hope that these small experiments and similar ones to be carried out in the future will plant a seed of practices that more powerfully integrate good data, alertness to transformational possibilities and ethical decision making.

As reported in the Introduction, the framing of the integration of systems and futures thinking by taking a second-order science perspective emerged in the course of the research. Critical publications informing this step only appeared in 2014 as the work was reaching its conclusion. The characterisation of second order science has been covered in Chapter 10 but in the literature reviewed there was little consideration of methodology as such. However, I propose to use a further piece of work by Muller (2014) drawing on his articulation of a possible general methodology for second order science. A preview of this was given in the *Introduction and Overview*. I will use a slightly modified

version of this (p40) to review the process of my own research, bringing out the congruence which indicates that the research itself was an emergent second-order process.

Muller proposes eight steps on a second order research process. I will summarise them, quote the definition given by Muller (2014, p 37-40) and comment on the way they took place in my own research.

1 Choose First Order Theme of Inquiry

"The initial move in a second-order analysis lies in the specification of a common or target first-order theme which lies in the center of subsequent explorations"

This research began with an enquiry into the possibility of integrating systems and futures thinking. The presupposition in both fields was 'as is' such that systems thinking was largely first-order (as in classical system dynamics) and futures thinking likewise (as in scenario planning).

2 Creation of Second-Order Topic Through Reflexivity

"The next step produces a re-entry in the common theme and its transformation to a second-order topic."

The Muller formulation characterises this step as the introduction of re-entry (as for example in the cybernetics of cybernetics). However, the version of re-entry taken in my approach was to introduce reflexivity both in the consideration of systems thinking and also futures thinking focused on the treatment of time.

3 Formulating Goals of Analysis

"The next step requires and explicit formulation of goals of the participant researchers….The goals of analysis have to specify the objectives which a second order analysis has to reach."

The goal for this stage was more about synthesis than analysis. It was to take a transdisciplinary approach to construct an inclusive paradigm that transcends the incompatibilities of the framing of first-order systems thinking and first order futures thinking. This was formulated initially as a search for a meta-framing.

4 Widening Analysis with Further First Order Topics of Relevance

"The fourth step lies in building a sufficiently large set with first order elements on the common second-order topics … the second-order theme has to be widened in order to establish a rich first-order basis of relevant building blocks for subsequent second-order explorations."

The transdisciplinary reflections on the widening of the analysis identified a number of topics that offered promise of informing the construction of a new framing for considering the integration. As Figure 11.1 shows the six main widening topics are phenomenology of time experience, the scenaric stance, ontology of the present moment, boundary critique, the nature of anticipatory systems and induction and reperception.

5 Re-configuring First Order Topics for Breakthrough

"The next step …is an ordering of the various building blocks according to a small set of ordering parameters."

This is the most difficult step which requires both analytical, creative and reflexive thinking working together to

- Assimilate the phenomenology of time experience
- Keep an open minded scenaric stance towards the future
- Dig deeper into to the nature of anticipatory systems
- Consider the ontology of the present moment including the implications of multi-dimensionality
- Extend the second-order nature of boundary critique to include a time boundary
- Consider of reperception from the perspectives of induction, creativity and enactive cognition

It should be emphasised that this is a reflective or 'mulling over' process which is non-linear and unpredictable in which the outcome of the next step was not foreseen at the time. This stage of reflection led to the prioritising of the three themes of the title of this work, time, pattern and perception.

6 Integrating, Deepening, Heightening, Synthesis

"The sixth step in the general methodology of second-order science stresses the need to find new solutions which are capable of entailing all major building blocks from the first-order contributions."

The breakthrough came with the conception of the Anticipatory Present Moment (Diagram 12.4) as the integrating reconfiguration. The key to this concept lies in its proposition that the integration of systems and futures can take place in the context of a second-order interpretation of the anticipatory system which allows for adapting to signals from the future (feedforward) as well as from the past (feedback) and in which the consciousness state of the observer/decider is critical to the appreciation of both system and foresight. This notion could not be achieved by simply assembling the components in a first-order way.

7 Reflecting in Implications for the First-order Theme

"In this part of analysis the transfer elements of second-order investigations and their effects and impact on first –order research are to be discussed in greater detail."

The implications for the initial question were explored by reviewing a number of models and associated problem structuring methods in the light of the APM. This highlighted aspects of the models in relation to the present moment of the method application, their theoretical capacity for anticipation and the extent to which they might themselves be reframed to include a more second-order application.

The meta-analysis of the various methods covered in Chapters 13-15 are summarise in the following Table 17.1 They all indicate potential for further research which is beyond the scope of this present work.

Concept and Method	APM Based Reflections	Reference
Decision Integrity	Potential role of mindfulness practices for improving integration of first order analysis and second-order values	Section 13.3
Boundary critique	Extension of boundary critique to includes the span of present moment of the system in question, especially comparison of each party in a situation of dispute	Section 14.1
Viable Systems Model	Potential of treating the S4-S3 homeostat as an anticipatory present moment and thus designed and facilitated accordingly	Section 14.2
World System Model	Using the APM as a guide to determining the appropriate span of concern for applying the world system model in an anticipatory way	Section 14.3
Dilemma Resolution	Seeing dilemma resolution as a reflexive and dynamic anticipatory system that needs both feedback and feedforward to stimulate creative resolution	Section 14.4
Three Horizons	Seeing each horizon as emphasising a different dynamic within the present moment of transformation, and the triangle of transformation as the place where the potential role of the APM as a diagnostic guidance tool is the greatest.	Section 15.4

Table 17.1 APM Reflections on Concepts and Methods

8 Considering Impact on the Wider Context

"This additional step requires at least a small analysis of a particular second order study and its outcomes on the one hand and the potential consequences and effects of this specific piece of research on the wider environment across science and society in general."

Although the research is theoretical it was prompted by questions arising from decades of practice. The exploration included a question as to whether a fresh perspective or 'upframing' would offer indications for improved practice. In strategy work it is useful to understand the systems of agency, the environmental context and the anticipations of the future. The APM and the multi-dimensional version of the present moment can be used to devise new techniques for practioners to structure their first-order analysis and their second-order reflection on the meaning that analysis as well as enrichment of that analysis with additional ways of knowing. This guided the preliminary experiments reported in Chapter 16.

Finally, why do I think this piece of research is significant? What I have come to through this work boils down to something very simple but with profound implications.

In the fields of either policy or strategy, decision-makers are faced with trying to make sense of what can be known about the world in which they are acting combined with what they can anticipate about future conditions, which can be as much as half a century or more into the future. Improving decision support from the known has led to such fields as evidence-based policy. And improving ways of looking into the future has led to such disciplines as scenario planning. However, looking into the future does not involve the construction of evidence in the way that building on the past does. We have no means of measuring the future and there is always a role for intuition, imagination and inference. These two ways of looking at things, the evidence-based and the foresight-outreach do not yet have a common integral discipline. It is my hope that mindful anticipatory present moment practice will be a step in that direction and enable their combination to be more powerful than their application in separate disciplines.

****

References

Ackoff, R. (1974). *Redesigning the Future*. New York: Wiley.

Ackoff, R. (1981). *Creating the Corporate Future*. Chichester: Wiley.

Ackoff, R. (2001). A Brief Guide to Interactive Planning and Idealised Design. Ackoff.

Albert, D. Z. (2000). *Time and Chance*. Cambridge USA: Harvard University Press.

Albrow, M. (1997). *The Global Age*. Stanford, California: Stanford University Press.

Alexander, C. (1977). *A Pattern Language: Towns, Buildings, Construction*. New York: Oxford University Press.

Alexander, C. (1980). *The Timeless Way of Building*. Center for Environmental Structure.

Al-Khalili, J., & McFadden, J. (2014). *Life on the Edge: The Coming of Age of Quantum Biology*. London: Bantam Press.

Allen, T. (1996). *Hierarchy Theory: a vision, vocabulary, and epistemology*. New York: Columbia University Press.

Alroe, H. F., & Noe, E. (2014). Second-Order Science of Interdisciplinary Research: A Polyocular Framework for Wicked Problems. *Constructivist Foundations, 10*(1), 65–76.

Amara, R., & Lipinski, A. (1983). *Business Planning for an Uncertain Future, Scenarios and Strategies*. New York: Pergammon Press.

Argyris, C. (1990). *Overcoming Organizational Defences - facilitating porganizational learning*. Boston: Allyn & Bacon.

Argyris, C. (1991). Teaching Smart People How to Learn. *Harvard Business Review*, (May-June), 99–109.

Argyris, C., Putnam, R., & McClain Smith, D. (1985). *Strategy, Change and Defensive Routines*. San Francisco: Jossey Bass.

Argyris, C., & Schon, D. (1978). *Organisational Learning*. Reading, MA: Addison Wesley.

Arthur, W. B. (1990). Positive Feedback in the Economy. *Scientific American*, *262*(Feb), 92–99.

Ashby, R. (1956). *An Introduction to Cybernetics*. London: Methuen.

Ashby, R. (1960). *Design for a Brain*. London: Chapman and Hall.

Aufenvenne, P., Egner, H., & von Elverfeldt, K. (2014). On Climate Change Research, the Crisis of Science and Second-Order Science. *Constructivist Foundations*, *10*(1), 120–129.

Barber, P. (2006). *Becoming a Practitioner Researcher : A Gestalt Approach to Holistic Inquiry*. Middlesex: Middlesex University Press.

Barbour, John. (1999). *The End of Time*. London: Weidenfeld and Nicolson.

Barrett, F. J. (1998). Creativity and Improvisation in Jazz and Organizations: implications for Organizational Learning. *Organization Science*, *9*(5), 605–622.

Bars, I., & Terning, J. (2010). *Extra Dimensions in Space and Time*. (F. Nekoogar, Ed.). New York: Springer.

Barsch, J. (2008). Innovative management: A conversation with Gary Hamel and Lowell Bryan. *McKinsey Quartely*, *1*, 31.

Bateson, G. (1972). *Steps Towards an Ecology of Mind*. Chicago: Chicago University Press.

Bateson, G. (1979). *Mind and Nature: A Necessary Unity*. Isle of Man: Fontana.

Beer, S. (1975). *Platform for Change*. Chichester: Wiley.

Beer, S. (1979). *The Heart of the Enterprise*. Chichester: John Wiley and Sons.

Beer, S. (1985). *Diagnosing the System for Organizations*. Chichester: Wiley.

Beer, S. (1989). The Viable System Model: its provenance, development, methodology and pathology. In R. Espejo & R. Harnden (Eds.), *The Viable System Model: Interpretations and Applications of Stafford Beer's VSM*. Chichester: Wiley.

Beer, S. (1994). *Beyond Dispute: The Invention of Team Syntegrity*. Chichester: Wiley.

Bender, A., & Beller, S. (2011, 2012). The Cultural Constitution of Causal Cognition: Re-integrating Anthropology into the Cognitive Sciences. Center for Interdisciplinary Research. Retrieved from http://www.uni-bielefeld.de/%28en%29/ZIF/FG/2011Cognition/

Benn, D. J. (2011). Feeling the Future: Experimental evidence for anomalous retroactive influences on cognition and affect. *Journal of Personality and Social Psychology*, *100*(3), 407–425.

Bennett, J. G. (1966). *The Dramatic Universe* (Vol. 4). London: Hodder and Stoughton.

Bennett, J. G., Brown, R. L., & Thring. (1949). Unified Field Theory in a Curvature-free Five Dimensional Manifold. *Proceedings of the Royal Society*, (198), 39.

Bergson, H. (1910). *Time and Free Will: An Essay on the Immediate Data of Consciousness*. (F. L. Pogson, Trans.). London: George Allen and Unwin.

Bergson, H. (1992). *The Creative Mind: An Introduction to Metaphysics*. New York: Citadel Press.

Bermudez, J. L. (2009). *Decision Theory and Rationality*. Oxford: Oxford University Press.

Bhaskar, R. (1988). *Reclaiming Reality: A critical introduction to contemporary philosophy*. London and New York: Routledge.

Bion, W. R. (1961). *Experiences in Groups - and other papers*. London: Tavistock.

Bishop, J. M., & Nasuto, J. S. (2005). Second-order cybernetics and enactive perception. *Kybernetes*, *34*(9/10), 1309–1320.

Bishop, P., Hines, A., & Collins, T. (2007). The current state of scenario development: an overview of techniques. *Foresight*, *9*(1).

Bloch, E. (1995). *The Principle of Hope*. Cambridge, MA: The MIT Press.

Bohm, D. (1957). *Causality and Chance in Modern Physics*. Philadelphia: University of Pennsylvania Press.

Bohm, D. (1980). *Wholeness and the Implicate order*. London: Routledge and Kegan Paul.

Bohm, D. (1996). *On Dialogue*. New York: Routledge.

Bohm, D. (1996). *On Creativity*. Abingdon: Routledge Classics.

Bohm, D., & Nichol, L. (Editor). (2003a). The Causal-Ontological Interpretation and Implicate Order. In *The Essential David Bohm* (p. 193). Routledge.

Bohm, D., & Nichol, L. (Editor). (2003b). The Enfolding-Unfolding Universe and Consciousness. In *The Essential David Bohm* (p. 85). Abingdon: Routledge.

Bohr, N. (1976). *Collected Works, Volume 3, The Correspondence Principle (1918–1923) 3,*. Amsterdam: North Holland.

Boisot, M., Nordberg, M., Yami, S., & Nicquevert, B. (Eds.). (2011). *Collisions and Collaboration: The Organization of Learning in the Atlas Experiment at the LHC*. Oxford: Oxford University Press.

Börjesona, L., & Höjera, M. (2006). Scenario types and techniques: Towards a user's guide. *Futures*, *36*.

Bortoft, H. (1996). *The Wholeness of Nature: Goethe's Way of Science*. Hudson, NY: Lindisfarne Press.

Bortoft, H. (2012). *Taking Appearence Seriously: The Dynamic Way of Seeing in Goethe and European Thought*. Edinburgh: Floris Books.

Bowers, T. (2011). Towards a Framework for Multiparadigm Multimethodology. *System Research and Behavioral Science*, *28*(5), 537–552.

Boyd, S. C. (2010). Time, Interdisciplinarity, and Ethics in Autopoetic Cultures. Retrieved from http://www.inter-disciplinary.net/wp-content/uploads/2010/02/boydpaper.pdf 12/11/2015

Bruckner, R. L., & Carroll, D. C. (2007). Self-projection and the brain. *Trends in Cognitive Science*, *11*, 49–57.

Bunn, D. W., & Larsen, E. R. (2007). *Systems Modelling for Energy Policy*. Chichester: Wiley.

Burt, G. (2010). Revisiting and extending our understanding of Pierre Wack's the gentle art of re-perceiving. *Technological Forecasting & Social Change*, *77*, 1476–1484.

Burt, G., & van der Heijden, K. (2008). Towards a framework to understand purpose in Future Studies: The role of Vickers' Appreciative System. *Technological Forecasting and Social Change*, *75*, 1109–1127.

Bustard, D. W., He, Z., & Wilkie, F. G. (2000). Linking soft systems and use-case modelling through scenarios. *Interacting with Computers*, *13*, 97–110.

Callender, C. (Ed.). (2011). *The Oxford Handbook of Philosophy of Time*. Oxford: Oxford University Press.

Callender, C. (2014). Is Time an Illusion? *Scientific American*, *23*(4), 14–21.

Candy, S. (2010). *The Futures of Everyday Life: Politics and the Design of Experiential Scenarios* (Ph.D.). University of Hawaii.

Carman, T. (1999). The Body in Husserl and Merleau-Ponty. *Philosophical Topics*, *27*(2), 205–226.

Cavaleri, S., & Sterman, J. (1997). Towards evaluation of systems thinking interventions: A case study. *System Dynamics Review*, *13*(3), 253–265.

CDP. (2015). Carbon Pricing Pathways - Navigating the Path to 2 degrees C. CDP and the We Mean Business Coalition.

Celse, K. M. (2014). A Critique of the Leadership Style of Steve Jobs. Department of I-O Psychology, Touro University Worldwide. Retrieved from https://www.academia.edu/8300779/Critique_of_the_Leadership_Style_of_Steve_Jobs

Checkland, P. (1981). *Systems Thinking, Systems Practice*. Chichester: John Wiley and Sons.

Checkland, P., & Poulter, J. (2006). *Learning for Action: A Short Definitive Account of Soft Systems Methodology, and its use for Practitioners, Teachers and Students*. Chichester: John Wiley and Sons.

Checkland, P., & Scholes, J. (1990). *Soft Systems Methodology in Action*. Chichester: Wiley.

Checkland, P., & Scholes, J. (1999). *Soft Systems Methodology in Action: including 30 year retrospective*. Chichester: Wiley.

Chermak, T. j., Lynham, S. A., & Ruona, W. E. A. (2001). A Review of Scenario Planning Literature. *Futures Research Quarterly*, (Summer), 7–31.

Chermak, T. j. (2004). Improving decision-making with scenario planning. *Futures*, 295–309.

Chicoine-Piper, G., Chicoine-Piper, M., & Hodgson, A. (1997). *Scenario Thinking: How to navigate the uncertainties of unknown futures*. Pitlochry: Idon.

Christakis, A. N., & Bausch, K. C. (2006). *How People Harness Their Collective Wisdom and Power to Construct the Future in Co-laboratories of Democracy*. IAP.

Chogyam, N. (1995). *Wearing the Body of Visions*. New York & London: Aro Books.

Christensen, C. M. (1997). *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*. Cambridge USA: Harvard Business School Press.

Churchman, C. W. (1970). Operations research as a profession. *Management Science*, (17).

Churchman, C. W. (1979). *The Systems Approach and Its Enemies*. New York: Basic Books.

Clemson, B. (1984). *Cybernetics: A New Management Tool*. Tunbridge Wells: Abacus Press.

Conant, R., & Ashby, R. (1970). Every Good Regulator of a System Must Be a Model of That System. *International Journal of Systems Sciences*, *1*(2).

Cordoba, J.-R., & Midgley, G. (2008). Beyond organisational agendas: using boundary critique to facilitate the inclusion of societal concerns in information systems planning. *European Journal of Information Systems*, (17), 125–142.

Cordoba, J.-R. (2009). Critical reflection in planning information systems: a contribution from critical systems thinking. *Information Systems Journal*, *19*, 123–147.

Corning, P. A. (2010). The Re-Emergence of Emergence and the Causal Role of Synergy in Emergent Evolution. *Synthese*, (27 February 2010), 1–24.

Crutzen, P. J., & Schwagerl, C. (2011). Living in the Anthropocene: Towards a New Global Ethos. Yale Environment 360. Retrieved from http://e360.yale.edu/feature/living_in_the_anthropocene_toward_a_new_global_ethos/2363/

Curry, A., & Hodgson, A. (2008). Seeing in Multiple Horizons. *Journal of Futures Studies*, *13*(1), 1–20.

Curry, A., Hodgson, A., Kelnar, R., & Wilson, A. (2007). *Intelligent Infrastructure Futures*. London: Foresight Office of Science, UK Government.

Daedalus Trust. (2012). *Intoxication of Power*. Retrieved from http://www.daedalustrust.org.uk/2013/01/conference-materials/

Damasio, A. (2014). Remembering When,. *Scientific American*, *23*(Autumn), 42–47.

Dator, J., & Marsella, A. J. et al E. (1979). The Future of Cultures or Cultures of the Future. In *Perspectives on Cross-Cultural Psychology* (pp. 369–388). Academic Press.

de Bono, E. (1992). *Serious Creativity: Using the Power of Lateral Thinking to Create New Ideas*. Harper Collins.

De Geus, A. (1988). Planning as Learning. *Harvard Business Review*, (March-April), 70–74.

de Geus, A. (1992). Modelling to predict or to learn? *European Journal of Operational Research*, *59*(1), Introduction.

de Geus, A. (1997). *The Living Company*. London: Nichlas Brealey.

Denhardt, R. B., Denhardt, J. V., & Aristigueta, M. P. (2013). Fostering Creativity. In *Managing Human Behaviour in Public and Nonpropfit Organisations* (pp. 59–89). Sage,.

DeZeeuw, G. (1997). Three phases of science: a methodological exploration. Nijmegen Business School.

Di Corpo, U., & Vanini, A. (2010). Advanced Waves and Quantum Mechanics. *Syntropy*, *1*, 74–81.

Di Corpo, U., & Vanini, A. (2011). The Evolution of Life. *Syntropy*, *1*, 39–49.

Di Corpo, U., & Vanini, A. (2011). The Origin of Life According to the Law of Syntropy. *Syntropy*, (1), 34–35.

Di Corpo, U. (2013). Life Energy, Syntropy, Complementarity and Resonance. *Syntropy*, *2*, 4–38.

Di Paolo, E. A., & Iizuka, H. (2007). How (Not) to Model Autonomous Behaviour. University of Sussex.

Di Paolo, E. A., Rohde, M., & De Jaegher, H. (2007). Horizons for the Enactive Mind: Values, Social Interaction, and Play. University of Sussex.

Dirac, P. (1933, 1965). Theory of Electrons and Positrons -Nobel Lecture. Elsevier Publishing Company. Retrieved from http://www.nobelprize.org/nobel_prizes/physics/laureates/1933/dirac-lecture.html

Doyle, J. K. (1997). The cognitive psychology of systems thinking. *System Dynamics Review*, *13*(3), 253–265.

Dunne, J. W. (2001). *An Experiment With Time* (Preface by Russell Targ). Charlottesville: Hampton Roads.

Eden, C., & Ackerman, F. (2006). Where Next for Problem Structuring Methods. *The Journal of the Operational Research Society*, *57*(7), 766–768.

Ehrlich, P., & Ehrlich, A. (2013). Can a collapse of global civilization be avoided? *Proceedings of the Royal Society*, *280*, 1–9.

Einstein, A. (1923). *The Principle of Relativity*. London: Metheun.

Elsasser, W. M. (1998). *Reflections on a Theory of Organisms: Holism in Biology*. Baltimore: John Hopkins University press.

Emery, F. E. (1980). The environment and system-response capability. *Futures*, *12*(2), 113–127.

Emery, F. E., & Trist, E. L. (1973). *Towards a Social Ecology: Contextual Appreciations of the Future in the Present*. New York: Springer Science and Business Media.

Epstein, M. (1995). *Thoughts Without a Thinker: Psychotherapy from a Buddhist Perspective*. New York: Basic Books.

Espejo, R. (1996). Requirements for Effective Participation in Self-Constructed Organizations. *European Management Journal*, *4*, 414–422.

Espejo, R. (2000). Self-construction of Desirable Social Systems. *Kybernetes*, *29*(7/8), 949–963.

Espejo, R. (2003). The Viable System Model. Syncho Ltd. Retrieved from www.syncho.com

Espinosa, A., & Walker, J. (2011). *A Complexity Approach to Sustainability*. London: Imperial College Press.

Espinosa, A., & Walker, J. (2011). Viability through Complexity Management: Revisting the Viable Systems Model. In *A Complexity Approach to Sustainability: Theory and Application* (pp. 27–73). London and New York: Imperial College Press.

Espinosa, A., Cardosa, P. P., Arcaute, E., & Christensen, K. (2011). Complexity approaches to self-organisation: a case study from an Irish eco-village. *Kybernetes*, *40*(3/4), 536–558.

Faye, J. (2002). When Time Gets Off Track. In C. Callender (Ed.), *Time, Reality and Experience*. New York: Cambridge University Press.

Faye. (2010). Backward Causation. *The Stanford Encyclopaedia of Philosophy*.

Faye, J. (2014). Copenhagen Interpretation of Quantum Mechanics. *Stanford Encyclopaedia of Philosophy*, *Fall 2014 Edition*. Retrieved from http://plato.stanford.edu/cgi-bin/encyclopedia/archinfo.cgi?entry=qm-copenhagen

Fazey, I., Moug, P., Wise, R., Lindenfeld, L., Ballard, S., Degeorges, P., … Woods, M. (2016). Transformation Research and Powerful, Deliberate Practices for Transformation.

Fazey, I. (2010). Resilience and Higher Order Thinking. *Ecology and Society*, *15 (3)*(9).

Ferret, J. (2010). Anticipatory Systems in Physics. *Foresight*, *12*(3), 30–37.

Feynman, R. P. (1963). *Six Not-so-easy Pieces: Einstein's Relativity, Symmetry, and Space-Time*. Philadelphia: Basic Books.

Feynman, R. P. (1985). *QED*. Princeton University Press.

Flood, R. L., & Jackson, M. C. (1991). *Creative Problem Solving: total systems intervention*. Wiley, Chichester.

Flood, R. L., & Romm, N. R. A. (1996). *Critical Systems Thinking: Current Research and Practice*.

Flood, R. L., & Jackson, M. C. (1991). *Total Systems Intervention: A Practical Face to Critical Systems Thinking*.

Flood, R. L., & Carson. (1993). *Dealing with Complexity: An Introduction to the Theory and Application of Systems Science* (2nd ed.). New York: Plenum Press.

Foote, J. L., Gregor, J. E., Baker, V. E., Houston, D. J., & Midgley, G. (2007). Systemic problem structuring applied to community involvement in water conservation. *Journal of Operational Research*, (58), 645–654.

Foresight UK, U. G. B. (2006). *Intelligent Infrastructure Futures - The Scenarios Towards 2055* (Intelligent Infrastructure Futures). Retrieved from http://www.bis.gov.uk/foresight/our-work/projects/published-projects/intelligent-infrastructure-systems/reports-and-publications/project-outputs

Fortune, J., & Peters, G. (1995). *Learning from Failure: The systems approach*. Chichester: Wiley.

Franco, L. A. (2006). Forms of Conversation and Problem Structuring Methods. *The Journal of the Operational Research Society*, *57*(7), 813–821.

Friend, J., & Hickling, A. (1997). *Planning Under Pressure: The strategic choice approach* (2nd ed.). Oxford: Butterworth-Heinemann.

Fuenmayor, R., & Lopez-Garay, H. (1991). The Scene for Interpretive Systemology. *Systems Practice*, *4*(5), 1–17.

Fuenmayor, R. (1991). The Roots of Reductionism: A Counter-Ontoepistemology for a Systems Approach. *Systems Practice*, *4*(5), 2–28.

Fuenmayor, R. (1993). The Trap of Evolutionary Organicism. *Systems Practice*, *6*(5), 1–30.

Fuenmayor, R. (1991). Truth and Openness: An Epistemology for Interpretive Systemology. *Systems Practice*, *4*(5).

Fuenmayor, R. (1997). The Historical Meaning of Present Systems Thinking. *Systems Research*, *14*(4), 1–18.

Fuerth, & Faber, E. M. H. (2012). *Anticipatory Governance - Practical Upgrades : Equipping the Executive Branch to cope with increasing speed and complexity of major challenges*. Washington DC: Elliott School of International Affairs. Retrieved from http://forwardengagement.org/?option=com_content&view=article&id=6&Itemid=6

Fuller. (1975). *Synergetics: Explorations in the Geometry of Thinking*. Macmillan.

Fullsack, M. (2014). The Circular Conditions of Second-Order Science. *Constructivist Foundations*, *10*(1), 46–54.

Funtowicz, S. O., & Ravetz, J. R. (1990). *Uncertainty and Quality in Science for Policy*. Netherlands: Kluwer Academic.

Funtowicz, S. O., & Ravetz, J. (2003). Post-Normal Science. International Society for Ecological Economics.

Galvin, R. (1998). Science Roadmaps. *Science*, *280*.

Geersten, H. R. (2012). Rethinking thinking about Higher-Level Thinking. *Teaching Sociology*, *31*(1), 1–19.

Gell, A. (1992). *The Anthropology of Time: Cultural Constructions of Temporal Maps and Images*. Oxford: Berg.

Gharajedaghi, J. (2006). *Systems Thinking: Managing Chaos and Complexity: A Platform for Designing Business Architecture*. Burlington: Butterworth-Heinemann.

Godet, M. (2001). *Creating Futures: Scenario Planning as a Strategic Management Tool*. Economica, London.

Goerner, S. J., Dyck, R. G., & Lagerroos, D. (2008). *The New Science of Sustainability: Building a Foundation for Great Change*. North Carolina: Triangle Center for Complex Systems.

Golumbia, D. (2013). Robert Rosen and the Unfinished Deconstruction of Mechanism. Virginia Commonwealth University.

Goodman, P. S. (1966). An Empirical Examination of Elliott Jaques' Concept of Time Span. Tepper School of Business, Carnegie Mellon University. Retrieved from http://repository.cmu.edu/tepper

Goodwin, B. (1997). *How the Leopard Changed its Spots: Evolution of Complexity*. Phoenix.

Goodwin, B. (2007). *Nature's Due: Healing Our Fragmented Culture*. Edinburgh: Floris Books.

Goodwin, P., & Wright, G. (2010). *Decision Analysis for Management Judgement, 4th Edition*. Cheltenham: John Wiley and Sons.

Goswami, A. (1995). *The Self-Aware Universe: how consciousness creates the material world*. Los Angeles: Tarcher.

Grim, T. (2013). Foresight Maturity Model: Achieving Best Practices in Foresight. Foresight Alliance.

Grubb, M., Hourcade, J.-C., & Neuhoff, K. (2014). *Planetary Economics: Energy, Climate Change and the Three Domains of Sustainable Development*. London and New York: Earthscan Routledge.

Hall, A. D. (1962). *A Methodology for Systems Engineering*. van Nostrand.

Hamel, G., & Prahalad, C. K. (1998). Competing in the New Economy: Managing Out of Bounds. *Strategic Management Journal*, *17*(3), 237–242.

Hammond, D. (2003). *The Science of Synthesis: Exploring the Social Implications of General Systems Theory*. Boulder: University Press of Colorado.

Hampden-Turner, C. (1990). *Charting the Corporate Mind: From Dilemma to Strategy*. Oxford: Blackwell.

Harkins, A. M., & Morovec, J. W. (2011). Systemic approaches to knowledge development and application. *On the Horizon*, *19*(2), 127–133.

Heidegger, M. (1926). *Being and Time*. (J. Macquarrie & E. Robinson, Trans.) (Englich 1962). Oxford: Basil Blackwell.

Heirs, B. J., & Farrell, P. (1986). *The Professional Decision Thinker: Our New Management Priority*. London: Sidgwick & Jackson.

Heron, J., & Reason, P. (1997). A Participatory Enquiry Paradigm. *Qualitative Inquiry*, *3*(3), 274–294.

Hinton, C. H. (1887). *What is the Fourth Dimension?*.

Hodgson, A. (1992). Hexagons for Systems Thinking. *European Journal of System Dynamics*, *59*(1), 220–230.

Hodgson, A. (2007a). Appreciating the Future. In B. Sharpe & K. van der Heijden (Eds.), *Scenarios for Success* (pp. 291–299). Chichester: Wiley.

Hodgson, A. (2007b). Using Systems Thinking to Deepen Scenarios. *Systemist*, *29*(2), 71–80.

Hodgson, A. (2010). Decision Integrity and Second Order Cybernetics. In S. Wallis (Ed.), *Cybernetics and Systems Theory in Management: Tools, Views and Advancements* (pp. 52–74). Hershey: IGI Global.

Hodgson, A. (2012). A Transdisciplinary World Model. *Systems Research and Behavioural Science*, *29*(5), 517–526.

Hodgson, A. (2013). Towards an ontology of the present moment. *On the Horizon*, *21*(1), 24–38.

Holland, J. H. (1995). *Hidden Order - How Adaptation Builds Capacity*. Massachusetts: Helix Books, Addison-Wesley.

Holland, J. H., Holyoak, K. J., Nisbett, R. E., & Thagard, P. R. (1986). *Induction: Processes of Inference, Learning and Discovery*. Cambridge, MA: MIT Press.

Holland, J. H. (2006). Studying Complex Adaptive Systems. *Journal of Systems Science and Complexity*, *19*(1), 1–8.

Homer-Dixon, T. (2006). *The Upside of Down - Catastrophe, Creativity and the Renewal of Civilization*. Canada: Random House.

Homer-Dixon, T. (2010). Complexity Science and Public Policy. *Institute of Public Administration of Canada*, (New Directions Series).

Hoyle, F. (1983). *The Intelligent Universe: A new view of creation and the universe*. London: Michael Joseph.

Husserl, E. (1991). *On the Phenomenology of the Consciousness of Internal Time (1903-1917)*. Dordrecht: Kluwer Academic.

Inayatullah, S. E. (2004). *The Causal Layered Analysis (CLA) Reader*. Taipei, Taiwan: Tamkang University Press.

Ingold, T. (1999). From the Transmission of Representation to the Education of Attention. Dept Social Anthropology U of M.

Ingvar, D. (1985). 'Memory of the future': an essay on the temporal organization of conscious awareness. *Human Neurobiology*, *4*(3), 127–136.

Ison, R. L. (2008). Systems thinking and practice for action research. In *The Sage Handbook of Action Research: Participative Inquiry and Practice*. Sage, London.

ISSS. (2014). Origin and Purposes of the ISSS. Retrieved from http://www.isss.org/world/about-the-isss

Jackson, M. C. (2006). Creative Holism: A Critical Systems Approach to Complex Problem Situations. *Systems Research and Behavioural Science*, (23), 647–657.

Jackson, M. C. (2006). Creative Holism: A Critical Systems Approach to Complex Problem Situations. *Systems Research and Behavioural Science*, (23), 647–657.

Jaques, E. (1956). *Measurement of Responsibility*. London: Tavistock.

Kahane, A. (2004). *Solving Tough Problems.* San Francisco: Berrett-Koehler.

Kauffman, L. H. (n.d.). *Laws of Form - An exploration in Mathematics and Foundations*. Retrieved 29 Oct 2015 from http://homepages.math.uic.edu/~kauffman/Laws.pdf

Kauffman, S. (1996). *At Home in the Universe: The Search for the Laws of Self-Organisation and Complexity*. Oxford University Press.

Kelly, E., Leyden, P., & and GBN. (2002). *What's next? Exploring the terrain for business*. Chichester: John Wiley and Sons.

Kineman, J. J., & Poli, R. (2014). Ecological Literacy Leadership. *Bulletin of the Ecological Society of America*, *95*(1), 30–58.

King, A., & Schneider, B. (1991). *The First Global Revolution: A Report by the Council of the Club of Rome.* London: Simon and Schuster.

King, C. (2006). Quantum Cosmology and the Hard Problem of the Conscious Brain. In J. A. Tuszynski & N. Woolf (Eds.), *The Emerging Physics of Consciousness* (pp. 407–456). Springer.

King, C. (2014). Space, Time and Consciousness. Retrieved from www.dhushara.com/stc/ct.pd

Kleindorfer, P., Kunreuther, H., & Schoemaker, P. (1993). *Decision Sciences: an integrative perspective*. Cambridge.

Koestler, A. (1967). *The Ghost in the Machine*. UK: Hutchinson.

Kuhn, T. (1962). *The Nature of Scientific Revolutions*. University of Chicago Press.

Kuhn, T. (nd). Second Thoughts on Paradigms. Retrieved from http://eu.pravo.hr/_download/repository/Second_Thoughts_on_Paradigms.pdf 15/07/2015

Kostoff, R. N., & Schaller, R. R. (2001). Science and Technology Roadmaps. *IEEE Transactions on Engineering Management*, *48*(2), 132–143.

Kuosa, T. (2011). Evolution of futures studies. *Futures*, *43*, 327–336.

Kurtzweil, R. (1990). *The Age of Intelligent Machines*. Cambridge, MA: MIT Press.

Lane, D. C. (1993). The road not taken: observing a process of issue selection and model conceptualization. *System Dynamics Review*, *9*(3), 239–264.

Lang, T., & Allen, L. (2010). Reflecting on Scenario Practice: The Contribution of a Soft Systems Perspective. In *Business Planning for Turbulent Times*. London: Earthscan.

Langer, E. J., & Moldoveanu, M. (2000). The Construct of Mindfulness. *Journal of Social Issues*, *56*(1), 1–9.

Langley, P. A., & Morecroft, J. (1996). Learning from microworld environments: A summary of research issues. In G. P. Richardson & J. D. Sterman (Eds.), *System Dynamics '96*. System Dynamics Society.

Laszlo, E. (2014). *The Self-Actualizing Cosmos*. Rochester: Inner Traditions - Bear & Company.

Leicester, G. (2007). Policy Learning: can Government discover the treasure within? *European Journal of Education*, *42*(2), 173–184.

Leicester, G., Stewart, D., Bloomer, K., & Ewing, J. (2013). *Transformative Innovation in Education* (2nd ed.). Axminster: Triarchy Press.

Leicester, G., & O'Hara, M. (2009). *Ten Things To Do In A Conceptual Emergency*. Aberdour, Scotland: IFF/Triarchy.

Locker, A. (1997). The Present Status of General System Theory, 25 Years after Ludwig von Bertalanffy's Decease. Czech Republic: Centre for Systems Research. Retrieved from http://www.richardjung.cz/bert2.pdf.

Locker, A., & Coulter, N. A. (1975). Recent Progress Towards a Theory of Teleogenic Systems. *Kybernetes*, *5*, 67–72.

Locker, M. (2006). Reviving Paradoxes: Transclassical systems theory as meta-theory for a science-faith dialogue. Metanexus Institute, Pennsylvania.

Locker, M.-E. (2007). Perceiving Freedom and Meaning in Nature: Operationalizing Trans-Classical Systems Theory for Converging Scientific and Religious Knowing. Metanexus. Retrieved from http://www.metanexus.net/essay/perceiving-freedom-and-meaning-nature-operationalizing-trans-classical-systems-theory

Louie, A. H. (2010). Robert Rosen's anticipatory system. *Foresight*, *12*(3), 18–29.

Louie, A. H. (2013). *The Reflection of Life: Functional Entailment and Immanence in Relational Biology*. Dordrecht: Springer.

Low, A. (2013). A Cigarette is Sometimes Just a Cigarette. *World Futures: The Jouranl of Global Education*, *69*(4-6), 311–331.

Ludovivo, M. (2008). Syntropy: Definition and Use. *Syntropy*, *1*, 139–201.

Luhmann, N. (1990). The Autopoiesis of Social Systems. In *Essays on Self-Reference* (pp. 65–78). New York: Columbia University Press.

Luhmann, N. (2000). *The Reality of the Mass Media*. Cambridge: Polity Press.

MacCoby, M. (2009). Predict the Future better. *Research Technology Management*, *52*(6).

Macy Conferences. (1946). Summary. Retrieved from http://www.asc-cybernetics.org/foundations/history/MacySummary.htm

Magnam, M., & Cormier, L.-A. (n.d.). Financial Reporting Fraud: A Manifestation of Hubris in the C-Suite? Some Exploratory Evidence. Retrieved from http://www.daedalustrust.org.uk/2013/02/financial-reporting-frauds-a-manifestation-of-hubris-in-the-c-suite-some-exploratory-evidence-2013/

Margolis, Howard. (1987). *Patterns, Thinking and Cognition: A Theory of Judgement*. Chicago: University of Chicago Press.

Maira, A. A. (2014). *Redesigning the Aeroplane While Flying It: Reforming Instiutions*. New Delhi: Rupa & Co.

Markley, O. (2012). Imaginal Visioning for Prophetic Foresight. *Journal of Future Studies, 17*(1), 5–24.

Markosian, N. (2014). Time. In *The Stanford Encyclopaedia of Philosophy* (Spring 2014 Edition). Stanford University. Retrieved from http://plato.stanford.edu/cgi-bin/encyclopedia/archinfo.cgi?entry=time

Maturana, H. R. (1995). The Nature of Time. *Instituto de Terapia Cognitivia, Santiago de Chile*. Retrieved from http://www.inteco.cl/biology/nature.htm. 15/07/2015

Maturana, H. R., & Varela, F. J. (1980). *The Realization of the Living*. London: Reidal Publishing.

Maturana, H. R., & Varela, F. J. (1987). *The Tree of Knowledge: The Biological Roots of Human Understanding*. Boston & London: Shambhala.

Maxwell, J. C. (1865). A Dynamical Theory of the Electromagnetic Field. *Philosophical Transactions of the Royal Society of London, 155*, 459–512.

McCann, J. E., & Selsky, J. (1984). Hyperturbulence and Emergence of Type 5 Environments. *The Academy of Management Review, 9*(3), 460–470.

McDaniel, K. (2013). John M.E. McTaggart. In *The Stanford Ecyclopaedia of Philosophy*. Retrieved from {http://plato.stanford.edu/archives/win2013/entries/mctaggart/}},

Mcdermott, J. (1988). Preliminary Steps Toward a Taxonomy of Problem-Solving Methods. *Automating Knowledge Acquisition for Expert Systems*, *57*, 225–256.

McGilchrist, I. (2009). *The Master and his Emissary: The Divided Brain and the Making of the*

McTaggart, J. E. (1908). The Unreality of Time. *Mind, 17*(68), 457–474.

McTaggart, J. E. (1927). *The Nature of Existence* (Vol. 2). Cambridge University Press.

Merleau-Ponty, M. (1962). *Phenomenology of Perception*. (C. Smith, Trans.). London: Routledge and Kegan Paul.

Michael, D. (2010). *In Search of the Missing Elephant*. Axminster: Triarchy Press.

Midgley, G. (1992). The Sacred and Profane in Critical Systems Thinking. *Systems Practice, 5*(1).

Midgley, G. (1996). The ideal of unity and the practice of Pluralism in systems science. In *Critical Systems Thinking: current research and practice* (pp. 25–36). New York: Plenum Press.

Midgley, G. (1997). Dealing with coercion: Critical Systems Heuristics and beyond. *Systemic Practice, 10*(1), 37–57.

Midgley, G. (2000). *Systemic Intervention; Philosophy, Methodology, and Practice*. New York: Kluwer.

Midgley, G. (Ed.). (2002). *Systems Thinking* (Vols. 1–Volumes 1–1–4). Sage, London.

Midgley, G. (2011). Theoretical Pluralism in Systemic Action Research. *Systemic Practice and Action Research, 24*(1), 1–15.

Midgley, G. (2008). Systems Thinking, Complexity and the Philosophy of Science. *Complexity and Organization, 10*(4), 55–73.

Midgley, G., & Ochoa-Arias, A. E. (Eds.). (2004). *Community Operational Research : OR and Systems Thinking for Community Development*. New York: Springer Science and Business Media.

Midgley, G., Munlo, I., & Brown, M. (1998). The theory and practice of boundary critique. In J. Wilby (Ed.), *Methodology II Possibilities for Learning and Cross-cultural integration*. Hull: Centre for Systems Studies.

Midgley, G., & Pinzon, L. A. (2011). Boundary critique and its implications for conflict prevention. *Journal of the Operational Research Society, 62*, 1543–1554.

Midgley, M. (2014). *Are You an Illusion?*. Acumen Publishing.

Miller, R. (2007). Futures Literacy: A Hybrid Strategic Scenario Method. *Futures*, *39*(4).

Miller, R. (2011). Being without existing: the futures community at a turning point? A comment on Jay Ogilvy's 'Facing the Fold'. *Foresight*, *13*(4), 24–34.

Millett, S. D. (2011). *Managing the Future*. Axminster: Triarchy Press.

Minati, G. (2006). Multiple Systems, Collective Beings, and the Dynamic Usage of Models. *Systemist*, *28*(2), 200–211.

Mingers, J. (1992). Fuenmayor's Interpretive Systemology - A Critical Comment. *Systems Practice*, *5*(3), 335–342.

Mingers, J., & White, L. (2010). A review of recent systems thinking to operational research and management science. *European Journal of Operational Research*, *207*, 1147–1161.

Mingers, J. (1992). Criticizing the Phenomenological Critique - Autopoiesis and Crtiical Realism. *Systems Practice*, *5*(2), 173–180.

Mingers, J. (1992). Fuenmayor's Interpretive Systemology - A Critical Comment. *Systems Practice*, *5*(3), 335–342.

Mintzberg, H., Pascale, R. T., Goold, M., & Rumelt, R. P. (1996). The 'Honda Effect' Revisited. *California Management Review*, *38*(4), 78–91.

Mitroff, I., & Mason, R. (1982). Business Policy and Metaphysics: Some Philosophical Considerations. *The Academy of Management Review*, *7*(3).

Montuori, A. (2008). Transdisciplinarity. In *On Complexity* (p. p xxvii). New Jersey: Hamilton Press.

Montuori, A. (2013). Complex Thought: An Overview of Edgar Morin's Intellectual Journey. *Metaintegral Foundation*, (Resource Paper), 1–23.

Montuori, A., & Donnelly, G. (n.d.). Creativity at the Opening of the 21st Cebtury. *Creative Nursing*, *19*(2), 58–63.

Morecroft, J. (1988). System dynamics and microworlds for policy makers. *European Journal of Operational Research*, *35*, 301–320.

Morecroft, J. (2007). *Strategic Modelling and Business Dynamics*. Wiley.

Morin, E. (1999). *Seven Complex Lessons in Education for the Future*. UNESCO.

Morin, E. (2008). *On Complexity*. New Jersey: Hamilton Press.

Mozersky, J. M. (2006). A Tenseless Account of the Presence of Reality. *Philosophical Studies*, *129*(3), 441–476.

Mozersky, J. M. (2011). Presentism. In *The Oxford Handbook of Philosophy of Time*. Oxford: Oxford University Press.

Muller, K. H., & Riegler, A. (2014). Second-Order Science: A Vast and Largely Unexplored Sceince Frontier. *Constructivist Foundations*, *10*(1), 7–15.

Muller, K. H. (2016). *Second-Order Science: The Revolution of Scientific Structures*. Wien: Edition Echoraum.

Mycoted. (2015). Creativity and Innovation Techniques - an A to Z. Retrieved from http://www.mycoted.com/Category:Creativity_Techniques

Naydler, J. (1996). *Goethe on Science: An Anthology of Goethe's Scientific Writings*. Edinburgh: Floris Books.

Nicoluscu, B. (2007). Transdisciplinarity - past, present and future. In *Moving Worldviews: Reshaping sciences, policies and practices for endogenous sustainable development* (Vol. Nicolescu). Leusden: Compas.

Normann, R. (2001). *Reframing Business: When the Map Changes the Landscape*. Chichester: Wiley.

Ogilvy, J. (2011). Facing the Fold: from the eclipse of Utopia to the restoration of hope. *Foresight*, *13*(4), 7–23.

Owen, D., & Davidson, J. (2009). Hubris syndrome: An acquired personality disorder? A study of US Presidents and UK Prime Ministers over the last 100 years. *Brain*, 1–11.

Ozbekhan, H. (1970). The Predicament of Mankind. The Club of Rome.

Papamichail, K. N. (2007). Facilitation processes in decision workshops. *Journal of the Operational Research Society, 58*, 614–632.

Parks, M. S., & Steinberg, E. (1993). Dichotic Property and Teleogenesis. *Kybernetes*, *7*(4), 259–264.

Pascale, R. T. (1999). Surfing the Edge of Chaos. *MIT Sloan Management Review*, (Spring).

Penrose, R. (1989). *The Emperor' New Mind: Concerning Computers, Minds and the Laws of Physics*. Oxford University Press.

Penrose, R. (2010). *Cycles of Time: An Extraordinary New View of the Universe*. UK: Bodley Head.

Penrose, R. (2000). *The large, the Small and the Human Mind*. Cambridge: Cambridge University Press.

Penrose, R., & Isham, C. (1989). *Quantum Concepts in Space and Time*. Oxford University Press.

Perez, C., Haunsch, H. (ed), & Pyka, A. (ed). (2007). Finance and technical change: A long term view. In *Elgar Companion to Neo-Schumpeterian Economics*. Cheltenham: Edward Elgar Publishing.

Petrov, V. (2010). Dynamic ontology as an ontological framework for anticipatory systems. *Foresight*, *12*(3), 38–49.

Piaget, J. (1977). *The role of action in the development of thinking. In Knowledge and development*. New York: Springer.

Poli, R. (2007). Three Constructions: forms of causation, chronotopoids, and levels of reality. *Axiomethes, 17*.

Poli, R. (2010). The Many Aspects of Anticipation. *Foresight*, *12*(3), 7–17.

Poli, R. (2011). Steps Toward an Explicit Ontology of the Future. *Journal of Future Studies, 16*, 67–78.

Poli, R. (2013a). A Note on the Difference Between Complicated and Complex Social Systems. *Cadmus, 2*(1), 142 –147.

Poli, R. (2013b). Overcoming Divides. *On the Horizon*, *21*(Iss 1), 3–14.

Poli, R. (2014). Anticipatory Governance, Auftragstaktik, and the Discipline of Anticipation. University of Trento.

Pompa, L. (1975). *Vico: A Study of the New Science*. London: Cambridge University press.

Price, H. (2012). Does time-symmetry imply retrocausality? How the quantum world says 'Maybe'? *Studies in History and Philosophy of Science PartB: Studies in History and Philosophy of Modern Physics*, *43*(2), 75–83.

Prigogine, I. (1996). *The End of Certainty - Time, Chaos and the New Laws of Nature*. New York: Free press; Simon and Schuster.

Radin, D. (2006). *Entangled Minds: Extrasensory Experiences in a Quantum Reality*. New York: Paraview Pocket Books.

Rajagopalan, R. (2014). Knowing Differently in Systemic Intervention. Presented at the ISSS, Washington.

Rajagopalan, R., & Midgley, G. (2015). Knowing Differently in Systemic Intervention. *Systems Research and Behavioral Science*, *32*, 546–561.

Rajagopalan, R. (2016). Immersive Systemic Knowing: Rationality and beyond: Ph.D. Thesis. University of Hull.

Ramirez, R., & Ravetz, J. (201AD). Feral futures: Zen and aesthetics. *Futures*.

Reichel, A. (2008). Observing the Next Organisation. *Systemist*. Retrieved from andrereichel.de/resources/UKSS_2008_Reichel.pdf

Rittel, H., & Webber, M. (1973). Dilemmas in a general theory of planning. *Policy Sciences, 4*, 155–169.

Ritz, T., Adem, & Schulten. (2000). A Model for Photoreceptor-Based Magnetoreception in Birds. *Biophysical Journal*, *78*, 707.

Rosenhead, J., & Mingers, J. (Eds.). (2001). *Rational Analysis for a Problematic World Revisited: Problem Structuring Methods for Complexity, Uncertainty and Conflict*. Chichester: Wiley.

Rosen, R. (1985). *Anticipatory Systems: Philosophical, Mathematical and Methodological Foundations*. Pergammon Press.

Rosen, R. (1991). *Life Itself: A Comprehensive Inquiry into the Nature, Origin and Fabrication of Life.* Columbia University Press.

Rossel, P. (2010). Making anticipatory systems more robust. *Foresight*, *12*(3), 72–85.

Saeed, et al. (2014). Epigenetic programming during monocyte to macrophage differentiation and trained innate immunity. *Science*.

Schon, D. (1983). *The Reflective Practitioner - how professionals think in action*. New York: Basic Books.

Scollozzi, & Poli, R. (2015). System dynamics education: becoming part of anticipatory systems. *On the Horizon*, *23*(2), 107–118.

Scott, B. (2007). Richard Jung and the Cybernetic Phenomenology of the Self. *Cybernetics and Human Knowing*, *18*(1-2), 191–194.

Searle, J. R. (2000). Consciousness, Free Action and the Brain. *Journal of Consciousness Studies*, *7*(10), 3–22.

Seligman, M. E. P., Railton, P., Baumeister, R. F., & Sripada, C. (2013). Navigating Into the Future or Driven by the Past. *Perspectives on Psychological Science*, *8*, 119–141.

Sharpe, B. (2008). Third Horizon Innovation: finding ourselves in the future. James Martin Institute for Science and Civilisation, Oxford University.

Sharpe, B. (2013). *Three Horizons: the patterning of hope*. Axminster: Triarchy Press.

Sharpe, B., & Hodgson, A. (2006). Towards a Cyber-Urban Ecology: Intelligent Infrastructure Futures Technology Forward Look. Office of Science and Technology.

Sharpe, B., & van der Heijden, K. (Eds.). (2007). *Scenario for Success: Turning Insights into Action*. Chichester: Wiley.

Sharpe, B., Fazey, I., Hodgson, A., Leicester, G., & Lyon, A. (2016). Three Horizons: A Pathways Practice for Transformation. *Forthcoming*.

Simon, H. A. (1996). *The Sciences of the Artificial*. Cambridge, MA: The MIT Press.

Slaughter, R. (2004). *Futures Beyond Dystopia: Creating Social Foresight*. Routledge Farmer, London.

Smolin, L. (2013). *Time Reborn: From the Crisis in Physics to the Future of the Universe*. Penguin.

Snow, C. P. (1959). *The Two Cultures*. Cambridge University Press.

Snowden, D. J., & Boone, M. E. (2007). A Leader's Framework for Decision Making. *Harvard Business Review*, (November), 1–9.

Sokolowski, R. (1974). *Husserlian Meditations*. Northwestern University Press.

Sole, R., & Goodwin, B. (2000). *Signs of Life: How Complexity Pervades Biology*. New York: Basic Books.

Soros, G. (2006). *The Age of Fallibility: The Consequences of the War on Terror*. Phoenix Paperback.

Spencer-Brown, G. (1972). *Laws of Form*. The Julian press.

Stacey, R. D. (1996). *Complexity and Creativity in Organizations*. San Francisco: Berrett-Koehler.

Stark, S. (1961). Executive Foresight: Definitions, Illustrations, Importance. *The Journal of Business*, *34*(1), 31–44.

Steen, L. A. (2010). The Science of Pattern. *Science*, *240*.

Sterman, J. (1986). The economic longwave: theory and evidence. *System Dynamics Review*, *2*(2), 87–125.

Sterman, J. (2000). *Business Dynamics: Thinking and Modeling for a Complex world*. Boston: Irwin McGraw-Hill.

Stern, N. (2007). *The Economics of Climate Change: The Stern Review*. Cambridge: Cambridge University Press.

Strijbos, S., & Basden, A. (Eds.). (2006). *In Search of an Integrative Vision for Technology: Interdisciplinary Studies in Information Systems*. New York: Springer.

Strike, K., & Posner, G. (1983). Types of synthesis and their criteria. In S. Ward & L. J. Reed (Eds.), *Knowledge structure and use* (pp. 343–362). Philadelphia: Temple University press.

Targ, R., & Karra, J. (1989). *Miracles of Mind Exploring Nonlocal Consciousness and Spritual Healing*. Novata CA: New World Library.

Tegano, E. W. (1990). Relationship of Tolerance of Ambiguity and Playfulness to Creativity. *Psychological Reports*, *66*, 1047–1056.

Toffler, A. (1970). *Future Shock*. Random House.

Tversky, A., & Kahneman, D. (1974). Judgement under uncertainty: Heuristics and Biases. *Science*, (185), 1124–1131.

Ulrich, W. (1983). *Critical Heuristics of Social Planning: A New Approach to Practical Philosophy*. Bern: Haupt.

Ulrich, W. (1988). Systems thinking, systems practice, and practical philosophy: A program of research. *Systems Practice*, *1*(2), 137–163.

Ulrich, W. (1994). Can we secure future-responsive management through systems thinking and design? *Interfaces*, *24*(4), 26–37.

Ulrich, W. (2000). Reflective Practice in the Civil Society: The Contribution of Critically Systemic Thinking. *Reflective Practice*, *1*(2), 247–268.

Ulrich, W. (2005). A Brief Introduction to Critical Systems Heuristics. Open University Ecosensus. Retrieved from http://projects.kmi.open.ac.uk/ecosensus/publications/ulrich_csh_intro.pdf

Umpleby, S. (2007). Reflexivity in Social Systems: The Theories of George Soros. *Systems Research and Behavioural Science, 24*, 515–522.

Umpleby, S. (2010). From Complexity to Reflexivity: The Next Step in the Systems Sciences. *Cybernetics and Systems, 10*.

Umpleby, S. (2012). *Second Order Science: Logic, Strategies and Methods*. Presented at the Cafe Scientifique, Arlington, VA. Retrieved from http://www.gwu.edu/~uscs/docs/1112/wmsci_sos3.ppt

Umpleby, S. (2014). Second-order Science: Logic, Strategies, Methods. *Constructivist Foundations, 10*(1), 16–23.

Vaillant, G. (1992). *Ego Mechanisms of Defense: A Guide for Clinicians and Researchers*. Washington DC: American Psychiatric Press.

Van der Heijden, K. (2005). *Scenarios: The Art of Strategic Conversation* (2nd ed.). Chichester: Wiley.

Van der Heijden, K. (2009). Scenarios Planning. In T. M. Williams, K. Samset, & K. J. Sunnevag (Eds.), *Making essential choices with scant information (pp 68-84)*. New York: Palgrave Macmillan.

Van der Heijden, K., & Sharpe, B. (Eds.). (2007). *Scenarios for Success: Turning Insights into Action*. Chichester: Wiley.

Vanini, A. (2004). Entropy and Syntropy: from Mechanical to Life Science. *NeuroQuantology*, (2), 88–110.

Van Notten, P., Rotmand, J., van Asselt, M., & Rothman, D. (2003). An updated scenario typology. *Futures, 35*, 423–443.

Varela, F. J., Thompson, E., & Rosch, E. (1991). *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge, MA: The MIT Press.

Vickers, G. (1965). *The Art of Judgement: A study of policy making* (1983 3rd edn). London: Harper and Row.

Volker, J., & Scholl, A. (2014). Do the Media Fail to Represent reality? A Constructivist and Second-Order Critique of the Research on environmental Media Coverage and Its Normative Implications. *Constructivist Foundations*, *10*(1), 140–149.

Von Foerster, H. (1979). Cybernetics of Cybernetics. In K. Kippendorf (Ed.), *Communication and Control in Society*. New York: Gordon and Breach.

Von Foerster, H. (1995). Ethics and Second Order Cybernetics. *Stanford Humanities Review*, *4*(2), 308–319.

von Foerster, H. (2014). *The Beginning of Heaven and Earth Has No Name*. (A. Muller & K. H. Muller, Eds.). New York: Fordham University Press.

von Glasersfeld, E. (2001). The Radical Constructivist View of Science. *Foundations Of Science*, *6*(1-3), 31–43.

Voros, J. (2006). Introducing a classification framework for prospective methods. *Foresight*, *8*(2), 43–56.

Voros, S. (2014). The Uroboros of Consciousness: Between the Naturalisation of Phenomenology and the Phenomenolisation of Nature. *Constructivist Foundations*, *10*(1), 96–104.

Wack, P. (1985a). Scenarios: The Gentle Art of Re-Perceiving. *Harvard Business Review.*

Wack, P. (1985b). Scenarios: uncharted waters ahead. *Harvard Business Review*, (September-October), 77.

Wahl, D. C. (2016 Forthcoming). *Living the Questions, Together! Transformative Innovation & Design for Regenerative Cultures*. Axminster: Triarchy Press.

Wallis, S. (Ed.). (n.d.). *Cybernetics and Systems Theory in Management: Tools, Views and Advancements*. Hershey, PA: IGI Global.

Warfield, J. N. (1999). Twenty Laws of Complexity Science: cience Applicable in Organizations. *Systems Research and Behavioural Science*, *16*, 3040.

Warren, K. (2002). *Competitive Strategy Dynamics*. Chichester: Wiley.

Weed, M. (2005). Meta Interpretation: A Method for Interpretive Synthesis of Qualitative Research. *Qualitative Research*, *6*(1), Art 37.

Weick, K. E., Sutcliffe, K. M., & Obstfeld, D. (2005). Organizing and the Process of Sensemaking. *Organization Science*, *16*(4), 409–421.

Welmsfelder, F., Hunter, E. a., Mendl, M. T., & Lawrence, A. B. (2000). The spontaneous qualitative assessment of behavioural expressions in pigs: First exploration of s novel animal welfare measurement. *Animal Behaviour Science*, *67*, 193–215.

White, L. (2006). Evaluating problem-structuring methods: developing an approach to show the value and effectiveness of PSMs. *The Journal of the Operational Research Society*, *57*(7), 842–855.

Wilby, J. (2011). A New Framework for Viewing the Philosophy, Principles and Practice of Systems Science. *Systems Research and Behavioural Science*, *28*, 437–442.

Wilczek, F. (2015). *A Beautiful Question: Finding Nature's Deep Design*. London: Penguin Press.

Wilkinson, A., & Kupers. (2013). Living in the Futures. *Harvard Business Review*, (May).

Winch, G. (1999). Dynamic Visioning for Dynamic Environments. *The Journal of the Operational Research Society*, *50*(4), 354–361.

Williams, A., Jones, D., & Robertson, J. (Eds.). (2014). *BITE: Recipes for Remarkable Research*. Rotterdam: Sense Publishers.

Winnicot, D. W. (1969). The Use of an Object. *International Journal of Psycho-Analysis*, *50*, 711–716.

Wolstenholme, E. (1993). A Case Study in Community Care Using Systems Thinking. *The Journal of the Operational Research Society*, *44*(9), 925–934.

World Game (1) Compilation from several games- www.understandingscotland.com; (2) UNESCO Water Institute on Delta Cities- http://vimeo.com/87784619 ; (3) Facing the Future conference, University of Dundee- https://www.youtube.com/watch?v=gMRGjDw9MbQ&feature=youtu.be

Wright, C., Kiparoglou, V., Williams, M., & Hilton, J. (2012). A Framework for Resilience Thinking. *Procedia Computer Science*, *8*, 45–52.

Yolles, M. (2001). Viable Boundary Critique. *Journal of the Operational Research Society*, (51), 1–12.

Acknowledgements

My deep gratitude goes to my wife, Lizzie for her forbearance of my lengthy disappearances into my study and her support in spite of my absences. My daughters Ali and Rebecca have also challenged me to explain what I am working on. I hope the final product makes some sense to them!

This research would not have been possible without the persistent and attentive support of Gerald Midgley, my supervisor. He provided the space and the advice to embark on a multi-disciplinary search to integrate two fields which, as I discovered part way through, live in different paradigms. I am grateful to Jennifer Wilby for introducing me to the Centre for Systems Studies. This work would not have been possible either without the generous support, mentally and financially, of the International Futures Forum by its Director, Graham Leicester and his colleague, Andrew Lyon.

Converting the idea of integrating systems and futures was partly prompted by Kees van der Heijden in a conversation at the IFF plenary in 2010. A great deal of my understanding of scenario planning was working with Kees, first in Shell and later at Strathclyde Business School. From the same quarter I am also indebted to many exchanges and collaborations with the former Head of Group Planning at Shell, Arie de Geus. I am also grateful to Charles Hampden-Turner for in-depth coaching on the nature of dilemmas and their resolution.

Much of the thinking I have drawn on has been stimulated by various gatherings and seminars run by IFF. Especially helpful in the early stage were the encouragement of Wolfgang Michalski and Maureen O'Hara. Alas, two important IFF influences on my work have now passed on, namely Brian Goodwin (d 2009) and Max Boisot (d 2011).

In this work I found myself drawing deeply on ideas encountered in my formative years whilst with J. G, Bennett (d 1974) who also introduced me to David Bohm (d 1992). From these two tutors I learned to think multi-dimensionally and to entertain a cosmic perspective. Also from that time I was fortunate to be a research fellow colleague of Henri Bortoft (d 2012). I was lucky to have a deep conversation with him about phenomenology, perception and qualitative science in 2011.

Steve Wallis and Andre Reichel stimulated deeper interest in second order cybernetics. Both conversations and collaborative working have been crucial for developing my ideas. Dealing with the complexity would have been even more difficult if Alfonso Montuori had not steered me towards the 'complex thought' of Edgar Morin and his own work on transdisciplinarity.

Conversational partners in developing my ideas have been Bill Sharpe, Roberto Poli, Daniel Wahl, Raghav Rajagopalan, Ian Kendrick, and Ioan Fazey. I especially acknowledge the immense tutoring of my creative and practice abilities, as well as the courage to think independently, given by Gary Chicoine over a twenty year period. The constructive feedback from my examiners has been especially helpful in gaining more clarity in my formulations. Any remaining errors or inconsistency is entirely down to me.